EXHIBIT 10

13281 U.S. PTO 040804

19587 U.S. PTO 10/820111 040804

PTO/SB/05 (03-01)
Approved for use through 10/31/2002. OMB 0651-0032
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	ALC 3125
First Inventor	Denis Armand Proulx
Title	CENTRALIZED INTERNET PROTOCOL/MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. ☑ Fee Transmittal Form (e.g., PTO/SB/17) *(Submit an original and a duplicate for fee processing)*
2. ☐ Applicant claims small entity status. See 37 CFR 1.27.
3. ☑ Specification [*Total Pages* 29] *(preferred arrangement set forth below)*
   - Descriptive title of the invention
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   - Statement Regarding Fed sponsored R & D
   - Reference to sequence listing, a table, or a computer program listing appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings (*if filed*)
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
4. ☑ Drawing(s) *(35 U.S.C. 113)* [*Total Sheets* 13]
5. Oath or Declaration [*Total Pages* 2]
   a. ☑ Newly executed (original or copy)
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6. ☑ Application Data Sheet. See 37 CFR 1.76
7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (*Appendix*)
8. Nucleotide and/or Amino Acid Sequence Submission (*if applicable, all necessary*)
   a. ☐ Computer Readable Form (CRF)
   b. Specification Sequence Listing on:
      i. ☐ CD-ROM or CD-R (2 copies); or
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   c. ☐ Statements verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

9. ☑ Assignment Papers (cover sheet & document(s))
10. ☐ 37 CFR 3.73(b) Statement *(when there is an assignee)* ☑ Power of Attorney
11. ☐ English Translation Document (*if applicable*)
12. ☑ Information Disclosure Statement (IDS)/PTO-1449 ☑ Copies of IDS Citations
13. ☐ Preliminary Amendment
14. ☑ Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
15. ☐ Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. ☐ Nonpublication Request under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.
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☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No.:________/__________

Prior application information: *Examiner:*__________________ *Group Art Unit:* ________

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Name (Print/Type)	Terry W. Kramer	*Registration No. (Attorney/Agent)*	41,541
Signature	Terry W. Kramer	*Date*	April 8, 2004

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FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 810.00

Complete if Known	
Application Number	New
Filing Date	April 8, 2004
First Named Inventor	Denis Armand Proulx
Examiner Name	Unassigned
Art Unit	Unassigned
Attorney Docket No.	ALC 3125

METHOD OF PAYMENT *(check all that apply)*

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☑ Deposit Account:

Deposit Account Number: 50-0578

Deposit Account Name: Kramer & Amado, P.C.

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FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	770	2001	385	Utility filing fee	770
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1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($) 770.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

			Extra Claims		Fee from below		Fee Paid
Total Claims	20	-20** =	0	X	18	=	0
Independent Claims	3	- 3** =	0	X	86	=	0
Multiple Dependent						=	

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
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1201	86	2201	43	Independent claims in excess of 3
1203	290	2203	145	Multiple dependent claim, if not paid
1204	86	2204	43	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

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FEE CALCULATION (continued)

3. ADDITIONAL FEES

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1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	40.00
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SUBTOTAL (3) ($) 40.00

SUBMITTED BY

(Complete *(if applicable)*)

Name (Print/Type)	Terry W. Kramer	*Registration No. (Attorney/Agent)*	41,541	*Telephone*	703-413-5000
Signature	Terry W. Kramer			*Date*	April 8, 2004

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First Named Inventor	Denis Armand Proulx
Examiner Name	Unassigned
Art Unit	Unassigned
Attorney Docket No.	ALC 3125

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☑ Deposit Account:

Deposit Account Number: 50-0578

Deposit Account Name: Kramer & Amado, P.C.

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SUBMITTED BY			(Complete *(if applicable)*)		
Name (Print/Type)	Terry W. Kramer	*Registration No. (Attorney/Agent)*	41,541	*Telephone*	703-413-5000
Signature	Terry W. Kramer			*Date*	April 8, 2004

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Centralized Internet Protocol / Multi-Protocol Label Switching Connectivity Verification in a Communications Network Management Context

Field of the invention

[01] The invention relates to communications network management and service provisioning, and in particular to methods and apparatus for centralized Internet Protocol / Multi-Protocol Label Switching connectivity verification in a communications network managed context ensuring adherence to service level agreements.

Background of the invention

[02] In the field of Internet Protocol (IP) / Multi-Protocol Label Switching (MPLS) communications, it is known to verify whether two data network nodes can reach each other by employing functionality provided by a "ping" command and a "traceroute" command. The implementation of the ping and traceroute commands functionality specification are described in Internet Engineering Task Force Request For Comments (RFC) 1147 which is incorporated herein by reference. A short summary of the relevant concepts of the ping and traceroute commands follows:

[03] Persons of ordinary skill in the art would understand that data communications networks conveying data packets in accordance with the IP protocol and/or the MPLS protocol do so in accordance with a store and forward discipline. At each data network node in a communications network, a packet is received via an input port, stored, an output port determined in real-time, and the packet is forwarded over the determined output port. Real-time port determination is known as routing functionality and is performed by a router network element. The real-time determination of the output port is made dependent on a variety of factors including: destination addressing information held in packet headers, forwarding class associativity, packet traffic differentiation, operational states of inter-connecting links between network nodes, transport bandwidth

availability over links, packet processing bandwidth availability at data network nodes in the path, etc.

[04] Persons of ordinary skill in the art would understand that data communications networks conveying data packets in accordance with the IP protocol, do so in accordance with a best-effort packet transport discipline. The best-effort discipline does not guarantee that data packets will reach their destinations, does not guarantee bounded packet arrival latencies, does not guarantee bounded packet arrival jitter, etc. In fact packets specifying the same source network address and the same destination network address do not necessarily follow the same transport path in a data communications network, which is known in the art as loose source routing.

[05] The real-time output port determination described above may lead to situations in which packet transport loops are established. Each IP packet carries a Time-To-Live (TTL) specification in its header, which is an integer header field value initially set by a source data network node sending the packet (or a gateway at an edge between a customer network and a service provider network) and decremented by each data transport node forwarding the packet. When the TTL value reaches zero (0), the packet is discarded.

[06] Although simple, this approach puts a lot of pressure on IP network design to ensure that only a small number of data transport nodes, and therefore interconnecting links, are traversed between a source data network node and a destination data network node. Physical implementations of interconnecting links varies and may include additional data/packet transport protocols – therefore from the point of view of connectivity verification, the data communications network infrastructure between two interfaces on two corresponding data transport nodes is referred to as a "hop" to make an abstraction thereof.

[07] As mentioned herein above, the best-effort packet transport discipline does not guarantee bound packet arrival latencies. Latency is the amount of time it takes for a packet to traverse a communications network from its source data network node to its destination data network node. Latency is typically measured in milliseconds and includes physical data transport delays associated with physically conveyance of packets

over physical interconnecting links, as well packet processing delays incurred by packets while being stored at transport network nodes, in a transport path between the source network node and the destination network node, while pending determination of output ports.

[08] As mentioned herein above, the best-effort packet transport discipline does not guarantee a bound packet arrival jitter. Jitter is a measure of the variation of packet inter-arrival delays, and relates to a measure of the standard deviation of a group of delays incurred by a group of individual data packets typically associated with a data stream used in provisioning a data service.

[09] The service provisioning, which is beyond the scope of the present description, is dependent on the resultant Quality-of-Service provided. Quality-of-Service is a combination of bandwidth, arrival delay, and jitter specifications for a particular data service provisioned end-to-end over a given interconnecting communications network infrastructure.

[10] A person skilled in the art would understand that the MPLS transport protocol has been developed in order to provide high Quality-of-Service packet transport. Although, delays associated with physical packet propagation over physical interconnecting links can only be reduced to a certain extent, the MPLS technology provides: bandwidth reservation on the interconnecting links to ensure a resource availability, strict (pre-specified) routing / transport path to minimize packet processing delays along the path, and consolidated multi-transport layer switching minimizing switching delays at switching network nodes in the path. Packets having the same source network address and the same destination network address may follow different transport paths dependent on a Service Level Agreement (SLA) specification for each packet.

[11] It is the adherence to a service level agreement in an MPLS environment, and the need to adhere to a service level agreement specification in a best-effort IP environment that is being addressed in the present description.

[12] The implementation of ping and traceroute functionality includes the return conveyance of at least one individual echo return Internet Control Message Protocol

(ICMP) packet, a packet probe, in a data communication network between a source network node and a destination network node to verify connectivity therebetween.

[13] The extent to which connectivity is verified by ping probe packets relates to reachability, see FIG. 1. Ping probe packets carry a TTL value, and therefore reachability includes: an assessment as to whether there is at least one bound sequence of interconnecting links which can be traversed by a packet conveyed between the source network node and the destination network node before the expiration of the TTL. It is emphasized that each ping probe packet tests connectivity between a pair of pre-specified source and destination network nodes.

[14] Besides testing reachability, each ping probe packet is also stamped with a time stamp value corresponding to the time at which the ping probe packet was issued by the source network node, enabling the calculation the aggregate return transport delay upon the return of the ping probe packet at the source network node. In sending a group of ping probe packets, the corresponding group of aggregate return transport delays are used to determine: minimum delay, maximum delay, average delay (in milliseconds), and jitter. The determined minimum delay, maximum delay, average delay, and jitter are referred to as packet transport statistics.

[15] The extent of connectivity verification performed by employing traceroute packets, as they are known, relates network node discovery in a path between a source to a destination network node, FIG. 2. Implementing traceroute functionality employs groups of ICMP echo return packets directed towards the destination network node and bearing increasing TTL values. Traceroute packets are returned to the source network node when the TTL value is decremented to zero, therefore the use of increasing TTL values in sending the traceroute packets discovering intermediary transport network nodes incrementally further along a path between the source network node and the destination node.

[16] Making reference to FIG. 3, for a source routed Label Switched Path (LSP) pre-established path, physical network nodes incrementally further along the LSP transport path may not return traceroute packets as the traceroute packets are encapsulated while in transport through the LSP, the TTL value only being decremented at the distal end of

the LSP which does return traceroute packets. Traceroute packets are of course returned by network nodes beyond the distal end of the LSP.

[17] In a best-effort IP environment, it cannot be guaranteed that all traceroute packets are routed the same as packet processing conditions change dynamically at network nodes between the source and the destination network nodes. A degree of stability in a communications network is expected, although not guaranteed, which when traceroute packets are sent in a relatively rapid succession, results in the group of traceroute packets following substantially the same transport path.

[18] Information held in returned traceroute packets is used to extract transport delay information. Statistical information is derived from successive sequences of traceroute packets. Therefore transport delay and jitter profiles can be provided for each determined transport path between a pair of network nodes in a communications network. The extent to which these delay and jitter profiles can be used to derive per-hop statistics is left to higher level applications interpreting the statistical information, higher level applications which are beyond the scope of the present description.

[19] Having provided an overview of ping and traceroute functionality, it is important to emphasize that, ping and traceroute packets are sent from a source network node and returned to the same source network node. The resulting statistics are also made available by, and at, the source network node.

[20] Service providers include organizations and communications network infrastructure providing communications services to customers. Services include best-effort packet transport, MPLS packet transport, as well differentiated services such as Virtual Local Area Networking (VLAN) in support of Virtual Private Network (VPN) connectivity.

[21] Currently service providers make extensive use of ping and traceroute functionality to verify connectivity on a very limited basis. Typically operations management personnel needs to physically and manually log-in on each remote source network node via a Command Line Interface (CLI), issue necessary ping and/or traceroute commands from a prompt specifying network node addressing manually,

capture the output of the console, and retrieve the output from the remote source network node.

[22] In service provider managed communications network it is more important to verify connectivity between individual routers. Routers include physical router communications network nodes as well virtual routers associated with switching communications network nodes. Referring to FIG. 4, five fully meshed routers R1, R2, R3, R4 and R5 are shown providing VPN services VPN1 and VPN2. Connectivity verification for VPN1 between Location 1 and Location 3 can be performed manually in two steps: ping/traceroute test T1 is run from R1 towards R3 and a second ping/traceroute test T2 is run from R3 towards R1. Each time a ping/traceroute test is run, the operator has to log-in on the source router, run the ping/traceroute test, and retrieve the results.

[23] If connectivity verification is required between all peer routers in VPN1 more test steps would be required: ping/traceroute test T3 verifies connectivity from Location 2 to Location 3, another ping/traceroute test would be necessary to verify connectivity to Location 3 from Location 2, another two ping/traceroute tests would have to be done between Location 1 and Location 2.

[24] The operator has to perform more ping/traceroute tests for the other VPNs such as VPN2 between Location 2 and Location 4.

[25] In performing connectivity verification in two separate steps between each pair of locations, it is not obvious to operations management personnel which router IP address and VLAN IDentifier (VPN1/VPN2) to use from which router. This level of operator involvement is inadequate as CLI command entry is a very time consuming, complex, and error prone procedure leading to large operational overheads incurred by service providers. In particular, manual command entry makes is impossible and untimely for connectivity verification to be performed in an environment in which a large number of customers subscribing to a corresponding large number of VPNs serviced by a service provider using an infrastructure of a large number of communications network nodes interconnected via a large number of links. Meaningful

statistics need be derived from a large number of ping/traceroute tests performed in a relatively short period of time.

[26] Packet traffic patterns vary over a period of time and are typically cyclical over the time of a day and cyclical over a week. Therefore it is important to both customers and service providers that connectivity verification be performed during peak hours (business hours and evenings) and peek weekdays (workdays and weekends). Therefore it is apparent that if manually directed connectivity verification is time consuming, then manual connectivity verification within test windows would be impossible due to overwhelming operational overheads involved. The number of connectivity verification tests grows with the number of location combinations for each VPNs making connectivity verification even more complex and time consuming.

[27] The closest prior art relates to network topology discovery and includes:

[28] A prior art United States Patent 6,502,130 B1 entitled "System and Method for Collecting Connectivity Data of an Area Network" which issued on December 31st, 2002 to Keeler, Jr. et al. describes a system and method which collects dynamic connectivity data from an area network interconnecting multiple computing devices. The dynamic connectivity information is combined in a data warehouse with static network information, relating to the various users and their privileges. The combined data stored in a data warehouse permits the identification of each user and the various privileges of the user, correlated by connection port. The connectivity data is collected using commands in the simple network management protocol (SNMP). SNMP commands query all network devices such as hubs, routers, and gateways to other networks to obtain port connectivity information such as the identity of the ports being used by each network user. Although inventive, the solution proposed by Keeler Jr. et al. only achieves Open Systems Interconnect (OSI) Layer 2 and 1 connectivity discovery in support of billing applications for users subscribing to roaming network access services. Keeler Jr. et al. do not address issues related to ensuring adherence to service level agreements in real-time.

[29] A prior art United States Patent 6,205,122 B1 entitled "Automatic Network Topology Analysis" which issued on March 20th, 2001 to Sharon et al. describes a

system and method for automatic detection of physical network topology, by correlating information from computers connected to a network. Although inventive, the solution presented by Sharon et al. does not address issues related to ensuring adherence to service level agreements in real-time.

[30] A prior art United States Patent 6,397,248 B1 entitled "System and Method to Discover End Node Physical Connectivity to Networking Devices" which issued on May 28th, 2002 to Iyer describes an apparatus and method for determining physical connectivity between end nodes and networking devices within a network. Iyer addresses issues related to the SNMP protocol's inability to ascertain the physical connection between end nodes and networking devices. Although inventive, the solution presented by Iyer does not address issues related to ensuring adherence to service level agreements in real-time.

[31] A prior art United States Patent 6,405,248 B1 entitled "Method and Apparatus for Determining Accurate Topology Features of a Network" which issued on June 11th, 2002 to Wood describes a method for determining accurate topology features of a given network utilizing source address tables. The solution proposes acquiring source address table information from each port of each network switching node at regular intervals to determine when a particular source address was learned and when discarded. The source address information is used to issue Address Resolution Protocol (ARP) queries to ensure that the source address information is valid. While inventive, the solution presented by Wood does not address issues related to ensuring adherence to service level agreements in real-time.

[32] A prior art United States Patent 5,974,237 entitled "Communications Network Monitoring" which issued on October 26th, 1999 to Shurumer et al. describes a proprietary method for monitoring a communications network comprising a plurality of node equipment such as switches, and link equipment such as fiber optic links in which proprietary performance parameters of individual vendor specific components of the node equipment are used to determine an overall proprietary performance parameter for the node equipment. By comparing like proprietary performance parameters for individual network elements, the performance of different types of proprietary network elements can be compared with each other. Parameters which can be monitored include

quality of service, cell discard, cell loss, and other measures of network performance. Connection tracing through the plurality of node equipment and link equipment is used employing proprietary means to provide topology discovery. While inventive, the solution presented by Shurumer et al. does not address issues related to ensuring adherence to service level agreements in real-time.

[33] Other developments include, a prior art United States Patent 6,222,827 B1 entitled "Telecommunications Network Management System" which issued on April 24^{th}, 2001 to Grant et al. which describes a system for managing a Synchronous Digital Hierarchy (SDH) network and proposes the tracking and processing of network related data in support of specifying connectivity parameters for establishing data pipes. The solution relates to a network management system which forms an overall view of the network and its condition, from which the system gives configuration commands to each transmission equipment so that all configuration changes can be performed significantly more rapidly. While inventive, the solution presented by Grant et al. does not address issues related to ensuring adherence to service level agreements in real-time.

[34] Reducing operating expenditures is important service providers. Addressing these concerns is especially important in large and complex service provider IP/MPLS communications networks. There therefore is a need to solve the above mentioned issues.

Summary of the invention

[35] In accordance with an aspect of the invention, a framework for connectivity verification is provided. The framework includes a connectivity verification server performing unattended connectivity verification, and a connectivity verification application, both the connectivity verification server and connectivity verification application operating in a network management context.

[36] In accordance with another aspect of the invention, connectivity verification jobs are defined via the connectivity verification application and the connectivity verification server is configured accordingly.

[37] In accordance with a further aspect of the invention, connectivity verification jobs are scheduled and the connectivity verification server performs scheduled connectivity verification.

[38] In accordance with a further aspect of the invention, the connectivity verification application also provides a display of connectivity verification results.

[39] In accordance with a further aspect of the invention, the results of each connectivity verification job may be compared against a desired connectivity profile and deviations from the connectivity profile may be used to raise alarms.

[40] In accordance with yet another aspect of the invention, connectivity verification results, including alarm information, are further used to generate a network map displaying selected connectivity verification results.

[41] The advantages are derived from using the framework to perform unattended scheduled connectivity verification at reduced operational costs.

Brief description of the drawings

[42] The features and advantages of the invention will become more apparent from the following detailed description of the preferred embodiment(s) with reference to the attached diagrams wherein:

FIG. 1 is a schematic diagram showing a ping connectivity verification test being performed manually between a source and destination node;

FIG. 2 is a schematic diagram showing a traceroute connectivity verification test being performed manually between a source and destination node;

FIG. 3 is a schematic diagram showing a traceroute connectivity verification test being performed manually between a source and a destination node via an LSP;

FIG. 4 is a schematic diagram showing prior art manual virtual private networking connectivity verification;

FIG. 5 is a schematic diagram showing elements of a connectivity verification framework in accordance with an exemplary embodiment of the invention;

FIG. 6 is a schematic diagram showing network nodes participating in a VPN and a fully meshed bi-directional group of connectivity validation tests to be performed in accordance with the exemplary embodiment of the invention;

FIG. 7 is a schematic diagram showing connectivity verification performed in accordance with the exemplary embodiment of the invention;

FIG. 8 is a schematic diagram showing a view of a human-machine interface enabling operations management personnel, in accordance with the exemplary embodiment of the invention, to manipulate ping connectivity verification jobs centrally in a network management context;

FIG. 9 is a schematic state diagram showing, in accordance with the exemplary embodiment of the invention, connectivity verification job states;

FIG. 10 is a schematic diagram showing a human-machine interface enabling operations management personnel, in accordance with the exemplary embodiment of the invention, to define a ping connectivity verification job;

FIG. 11 is a schematic diagram showing a human-machine interface enabling operations management personnel, in accordance with the exemplary embodiment of the invention, to define a traceroute connectivity verification job;

FIG. 12 is a schematic diagram showing another view of the human-machine interface shown in FIG. 8 enabling operations management personnel, in accordance with the exemplary embodiment of the invention, to manipulate traceroute connectivity verification jobs centrally in a network management context;

FIG. 13 is a schematic diagram showing, in accordance with the exemplary embodiment of the invention, an exemplary human-machine interface window enabling operations management personnel to define a schedule for a connectivity verification job; and

FIG. 14 is a schematic diagram showing, in accordance with the exemplary embodiment of the invention, an exemplary human-machine interface window enabling operations management personnel to define thresholds for a connectivity verification job.

[43] It will be noted that in the attached diagrams like features bear similar labels.

Detailed description of the embodiments

[44] FIG. 5 shows a connectivity verification framework 500 employed in a centralized communications management context in accordance with an exemplary embodiment of the invention. A connectivity verification application 502 makes use of a network map provided via an IP map application 504 and/or a Layer 2 map application 506 to enable selection 600 of displayed 602 source 102S and destination 102D network nodes from a group of managed network nodes tracked via a containment hierarchy 508 by a Managed Object Server (MOL) 511 of a Network Management System (NMS).

[45] The selected 600 source 102S and destination 104D network nodes are used in defining 604 a connectivity verification job. A schedule may also be defined 606 for the connectivity verification job, although once defined 604 the connectivity verification job may be dispatched 610 for execution immediately. Defining 604 of the connectivity verification job includes specifying connectivity verification parameters including the type and the number of connectivity verification tests to be performed, and optionally specifying thresholds 520 to be applied to connectivity verification results returned (as described herein below).

[46] In accordance with another implementation of the exemplary embodiment of the invention, by specifying (600) a source 102S and destination 102D network node pair, a pair of bi-directional connectivity verification tests is defined.

[47] The NMS system provides a centralized network management views of the managed communications network entities including: routers, IP links, IP interfaces, IP address of unmanaged routers, Label Switched Paths (LSPs), VPNs, etc. In accordance with another implementation of the exemplary embodiment of the invention, Internet

Protocol (IP) and Layer-3 source and destination managed entity object instances in the containment hierarchy 508 may be selected (600) from the containment hierarchy 508 itself.

[48] By selecting (600) a VPN managed entity, a group of participating network nodes 102 are specified. In accordance with another implementation of the exemplary embodiment of the invention, selecting 600 a group of network node managed entities, fully meshed bi-directional connectivity verification jobs are defined 600 such that corresponding connectivity verification tests are performed between all pairs of network nodes 102 in the selected group. FIG. 6 shows such an exemplary group of five selected network nodes 102 and corresponding bi-directional connectivity verification tests to be performed therebetween regardless whether physical fully meshed interconnecting links are provisioned therebetween (even if physical fully meshed interconnecting link are provisioned packet transport protocols, such as the Spanning Tree Protocol incorporated herein by reference, designate certain physical links as standby links). For clarity, for N network nodes 102 in a selected group, N(N-1)/2 bi-directional connectivity verification jobs are automatically defined 604 to dispatch 614 N(N-1) unidirectional connectivity verification tests between N(N-1)/2 pairs of selected (600) network nodes 102. Operations management personnel is provided with the means to collect the statistics from multiple connectivity verification tests. Therefore, once a managed VPN entity is selected, operation management personnel is provided with the means to easily dispatch 610, via a single click, a VPN connectivity verification job to verify the entire VPN connectivity.

[49] Each connectivity verification job can be dispatched 610 for immediate execution via a connectivity verification server 510 or stored 612 in a repository 512 associated with the connectivity verification server 510 for delayed and/or repeated dispatch 610. The connectivity verification server 510 initiates connectivity verification jobs based on the scheduling information specified in respect thereof. The connectivity verification server 510 queues connectivity verification tests for dispatch 614 via a Command Line Interface Processor (CLIP) 514 at the appropriate time specified in the defined schedule 606 or immediately upon request if the source managed entity (102S) specified in the corresponding connectivity verification test is idle. Scheduled connectivity verification jobs have priority at all times.

[50] The scheduled connectivity verification jobs have the added functionality that allows them to be queued for repeated execution, providing the ability to verify connectivity at specific times, and therefore to generate summary statistics from repeated results obtained in support of determining if customer SLA's are being met or if there is a failure in the communications network.

[51] In accordance with the exemplary embodiment of the invention, a mechanism is provided for scheduling multiple connectivity verification jobs. The connectivity verification server 510 includes a timer 507. The connectivity verification server 510 scans 607 scheduling information (606) specified in respect of queued connectivity verification jobs for connectivity verification tests to be dispatched 614 at specified times.

[52] The CLIP processor 514 takes over the issuing 616 of connectivity verification test commands (typically CLI commands, without limiting the invention thereto) to idle source managed entities (102S), and the retrieval 618 of connectivity verification results in an interaction session in which the CLIP processor 514 logs-on the source managed entity (102S). The CLIP processor 514 therefore provides the means for central collection of connectivity verification test results.

[53] The CLIP processor 514 sequences 620 command issuance so as not to overburden the communications network with ICMP traffic. The CLIP processor 514 does not issue subsequent commands to a managed entity until the last command issued has completed execution (and the results have been retrieved) irrespective of the schedule specified 606 for the connectivity verification job.

[54] Connectivity verification results are provided 622 to the connectivity verification server 510 which may compare 624 the connectivity verification results against thresholds 520 specified in respect of connectivity verification jobs assessing adherence to corresponding SLA agreements. When thresholds 520 are reached, alarms are raised 630 with an alarm server 530. The results and the alarm information may also be propagated 632 to the connectivity verification application 502. The alarm information provided 632 to the connectivity verification application 502 may be subsequently updated 634 by the alarm server 530.

[55] In accordance with another implementation of the exemplary embodiment of the invention, each connectivity verification result is compared against a threshold profile (520) comprising at least two thresholds 520, multiple thresholds being used to implement multiple levels of alarm severity.

[56] Subsequent to providing 632 connectivity verification results to the connectivity verification application 502. The connectivity verification application 502 uses the connectivity verification results and alarm information to display 640 and highlight Layer-2 (506) and Layer-3 (504) objects affected by the alarm. The connectivity verification results may be interacted with 642 to cause the display 640 of Layer-2 and Layer-3 objects associated with a particular connectivity verification job and/or connectivity verification test.

[57] Referring to FIG. 7, according to a use scenario of the exemplary embodiment of the present invention, operation management personnel can easily verify the VPN connectivity shown on the network map. In accordance with the example, only two VPNs 1 and 2 are provisioned. The operations management personnel defines two connectivity verification jobs J1 and J2 by selecting the VPN1 and VPN2 respectively. Selecting VPN1 and VPN2, specifies connectivity verification tests T1, T2, T3, T4, T5, and T6 to be performed between interfaces of routers (102) R1, R2 and R3, and further specifies connectivity verification tests T7, and T8 to be performed between routers (102) R2 and R4, respectively. Subsequent to selecting both connectivity verification jobs J1 and J2, with a single click, operations management personnel dispatches 610 the connectivity verification jobs for immediate execution.

[58] In accordance with an exemplary implementation of the exemplary embodiment of the invention, FIG. 8 shows an exemplary user interface enabling operations management personnel to manipulate connectivity verification jobs centrally in a network management context.

[59] The connectivity verification job manipulation window 800 is employed in manipulating defined (604) connectivity verification jobs in respect of both types of connectivity verification tests: ping and traceroute.

[60] The connectivity verification job manipulation window 800 contains three areas, a connectivity verification job pane 802, a results pane, and a statistics pane 806. The connectivity verification job pane 802 contains a list of connectivity verification jobs in that have already been defined 604 and/or saved 612 and ready for dispatch.

[61] The following Table 1 describes exemplary connectivity verification job field entries in the connectivity verification job list 802:

Column	Description
Type	Type of connectivity verification job, ping or traceroute
Name (not shown)	name associated to the connectivity verification job
Source	Source managed entity from which connectivity verification test(s) are being performed on
Destination	corresponding destination managed entity
Timeout (ms)	timeout used to wait for a test response from destination
Quantity	number of individual tests in the job
Interval (sec)	interval between ICMP packets sent
Status	status of the connectivity verification job

Table 1: Exemplary connectivity verification job field entries

[62] The following Table 2 describes exemplary connectivity verification job states, a corresponding connectivity verification job state diagram 900 is shown in FIG. 9:

Connectivity Verification Job State
Initial – connectivity verification job has just been created / never dispatched
In Progress – connectivity verification job dispatched, no results available yet
Completed – connectivity verification job results have been received
Cancelled – connectivity verification job cancelled, results are unavailable
Error - an error has occurred in respect of the connectivity verification job
Communication Error - a communication error has occurred, job cancelled

Table 2: Exemplary connectivity verification job states

[63] Depending on the state of the connectivity verification job, only certain actions are available. The "Initial" state of the connectivity verification job only occurs when the connectivity verification job is first added to the connectivity verification job list 802 (or retrieved from a file). Once dispatched 610, the connectivity verification job will stay in the "In Progress" state until either the operations management personnel cancels the connectivity verification job, or the connectivity verification job completes. When the operation enters the "Completed" or "Cancelled" state, the operations management personnel can dispatch the connectivity verification job or delete

connectivity verification job from the connectivity verification job list 802. The "Communication Error" state acts exactly as the "Cancelled" state during a server failure. If multiple connectivity verification jobs are queued for the same source managed entity, the state of waiting connectivity verification job(s) will be "In Progress" while the currently running/queued connectivity verification job(s) complete.

[64] The connectivity verification job list 802 will contain all the defined ping and traceroute connectivity verification jobs created and are distinguishable by the "Type" column.

[65] FIG. 10 and FIG. 11 show windows 1000 and 1100 enabling the definition of connectivity verification ping and trace route jobs, respectively. The following Table 3 details exemplary parameters specified for each individual ping connectivity verification job:

Field	**Description**
Name (not shown)	name for the ping connectivity verification job
Source	source managed entity on which the connectivity verification job is executed
Destination	Destination managed entity
Number of Pings	number of ping probe packets send
Interval (sec)	time to wait between the ping probes
Packet Size (bytes)	ping probe packet size
Fill Pattern	value to pad the ping probe packet with
Timeout per Ping (ms)	timeout period to wait for a response
Type of Service	type of service (or DSCP bits)

Table 3: Exemplary ping connectivity verification job parameters

The following Table 4 details exemplary parameters specified for each individual traceroute connectivity verification job:

Item	**Description**
Name	name for the traceroute connectivity verification job
Source	source managed entity on which the connectivity verification job is executed
Destination	Destination managed entity
Maximum TTL	maximum time to live
Probes per Hop	number of pings probes sent to each hop in the route
Interval (sec)	Wait period before issuing the next traceroute
Packet Size (bytes)	ICMP packet size
Fill Pattern	value to pad the ICMP packet with
Timeout per Probe	timeout period to wait for a response

(ms)	
UDP Port	port to send the traceroute to

Table 4: Exemplary traceroute connectivity verification job parameters

[66] Both ping and traceroute connectivity verification job have the same valid source and destination managed entities. To specify a router, node or LSP, the user can select it 600 as described above.

[67] Source NMS managed entities include, without limiting the invention: router (router managed by the NMS), first hop LSP (determines the source router), VPN (VRF name), etc. If an LSP is selected, the router and IP address fields are filled with the information from the source endpoint of the LSP including the management IP address of the source router.

[68] Destination NMS managed entities include, without limiting the invention: any IP address (NMS managed router and unmanaged router), routers, router interfaces (numbered and unnumbered (Router ID - string)), LSPs (the destination router being determined as the destination endpoint of the LSP), etc. To specify a destination communications network entity not managed by the NMS, operations management personnel must specify the IP address of the destination entity. If an LSP is selected, the router and IP address fields are filled with the information from the destination endpoint of the LSP.

[69] Selecting a interface, the associated IP address of the source router or node is filled in. If a VRF name is associated to a selected router interface, it will be used to automatically fill in the VRF name.

[70] Another way to specify a router or a node is to query the containment hierarchy 508 based on the management IP address. The operations management personnel can fill in the IP address in the IP address field and then press the "Enter" button. If this is the management IP address of a supported router or node, its particulars are filled in.

[71] All parameters defined for a connectivity verification job applies to all connectivity verification test executed based on that connectivity verification job.

[72] Once the source, destination, and corresponding parameters are specified, the connectivity verification job can then be added to the connectivity verification job list 802 by clicking the "Add" button. The connectivity verification job list 802 can be saved to a file or the repository 512 for retrieval at a later time enabling reuse of defined 604 connectivity verification jobs.

[73] Referring back to FIG. 8, a connectivity verification job added to an operation list does not automatically start the ping or traceroute operation, it must be dispatched 610 by selecting the configuration verification job, right clicking, and selecting "initiate" from a popup menu. The configuration verification job can be cancelled or deleted via the same popup menu.

[74] Selecting multiple connectivity verification jobs enables operations management personnel to dispatch 610 multiple connectivity verification jobs at one time with a single click of a button 810.

[75] To view the results of a connectivity verification job, the connectivity verification job must be "Complete". The results pane 806 is updated upon selecting a completed connectivity verification job from the connectivity verification job list 802. If the selected connectivity verification job is in progress, the results pane 806 will be blank and will automatically updated when the results are received 632.

[76] The results pane 804 displays received 632 results from completed ping or traceroute connectivity verification tests including incurred success status, and delays, from each individual ping or traceroute connectivity verification test. When showing results in respect of a traceroute connectivity verification job, the results pane 804 also shows hop information as shown in FIG. 12.

[77] In accordance with the exemplary embodiment of the invention, operations management personnel is provided with the means to specify that connectivity verification is to be performed periodically.

[78] FIG. 13 shows an exemplary window 1300 enabling operations management personnel to define 606 a schedule for a connectivity verification job. Table 5 details exemplary connectivity verification job scheduling parameters:

Item	Description
Process Every	The time between each run of the schedule
Frequency	The frequency of the connectivity verification job
Start Date	The date for this schedule to start running
Start Time	The time for this schedule to start running
End Date	The date for this schedule to start running
End Time	The time for this schedule to start running

Table 5: Exemplary connectivity verification job scheduling parameters

The process every field identifies the time between each run of the schedule itself if a timeframe is not specified. If frequency 0 is specified, the connectivity verification job will be dispatched once at the specified start date/time, the end date/time are ignored.

[79] Connectivity verification schedules may be listed, Table 6 shows exemplary fields for schedule list entries:

Column	Description
Enabled	This is a checkbox to enable or disable each schedule from running
Schedule	The unique name of the schedule
Start Time	The start time of the schedule
End Time	The end time of the schedule
Frequency	The time between connectivity verification jobs
Freq. Period	The type of frequency (i.e. days, hours, minutes, etc)
Alarm Status	Identifies the highest severity alarm that has not been acknowledged
Status	The status of the schedule, derived from the highest connectivity verification job status

Table 6: Exemplary schedule list entry fields

The schedule list contains defined 606 schedules identifying each schedule by its unique name. It allows enabling/disabling schedules by clicking the checkbox contained in the "Enabled" field associated to the schedule.

[80] Schedules may overlap which only needs to be addressed when connectivity verification tests have to execute on the same source managed entity. If multiple schedules overlap, the connectivity verification tests from one schedule could be interspersed with connectivity verification tests from another schedule. If a schedule cannot complete within the specified frequency, the next iteration will be skipped.

[81] Returning to FIG. 8 / FIG. 12 after an connectivity verification job completes, the operations management personnel may select the completed connectivity

verification job and the results are displayed in the result pane 804. The following Table 7 details exemplary results entry fields in respect of completed connectivity verification tests:

Column	Description
IP Address / Hop	Destination IP Address of the ping probe packets, or the IP address of a Hop for traceroute
Sequence	The sequence number of the individual ping or hop
Delay (ms)	The delay of the response from the destination

Table 7: Exemplary completed connectivity verification test results entry fields

If an error was encountered by one of the ping probe packets (i.e. valid diagnostics errors such as Network Unreachable or Node Unreachable) the delay column for that individual entry will display the error.

[82] FIG. 14 shows an exemplary window 1400 enabling operations management personnel to define at least one threshold 520 for a connectivity verification job. Table 8 details exemplary connectivity verification job threshold parameters:

Threshold	Item	Values	Description
N/A	Summary Period	5-1440	The number of iterations before calculating the summary statistics.
Jitter (ms)	Value	0–60000	The maximum variance in milliseconds before a jitter alarm is raised. A specific severity of alarm can be associated to this threshold value.
	Severity	Critical Major Minor Warning	
	(checkbox)	Disabled Enabled	Enables or disables this threshold value.
Delay (ms)	Value	0–60000	The maximum delay in milliseconds before a round trip delay alarm is raised. A specific severity of alarm can be associated to this threshold value.
	Severity	Critical Major Minor Warning	
	(checkbox)	Disabled Enabled	Enables or disables this threshold value.
Packet Loss (%)	Value	0–100	The number of connectivity failures allowed before a connectivity alarm is raised. A specific severity of alarm can be associated to this threshold value.
	Severity	Critical Major Minor Warning	
	(checkbox)	Disabled Enabled	Enables or disables this threshold value.

Table 8: Exemplary connectivity verification job threshold parameters

The summary period field identifies the number of iterations to wait before calculating summary statistics and alarms are raised. If an iteration is skipped, then that iteration will not be included in the summary period. The threshold fields identify the threshold limit and the associated alarm severity to use if an alarm is raised. Setting thresholds for expected connectivity verification test results to trigger alarms when data packet flow requirements are not met, provides monitoring means ensuring adherence to SLA agreements. Table 9 details exemplary alarm levels raised in accordance with specified threshold values:

Description
Critical Alarm – A critical alarm has been generated
Major Alarm – A Major alarm has been generated
Minor Alarm – A Minor alarm has been generated
Warning Alarm – A warning alarm has been generated
Error – An error has occurred during a summary period
Normal –no errors or alarms

Table 9: Status values for each Operation in the Operation List

[83] Returning to FIG. 8 / FIG. 12, the statistics pane 806 displays statistics regarding a connectivity verification job, such as jitter and packet loss percentage. In the case of a traceroute connectivity verification job, the statistics are based on the selected hop in the results pane 804.

[84] The results and statistics can be saved to a local file in one of two formats, text or CSV. The following is exemplary of a text format file:

```
Ping    New York – Boston
Source 138.120.15.90: vrf - VPN1    Destination    13.13.13.2
Seq     Source              Destination     Delay (ms)
1       138.120.15.90       13.13.13.2      112
2       138.120.15.90       13.13.13.2      Node Unreachable
3       138.120.15.90       13.13.13.2      98
%Loss: 0.0    Jitter (ms): 0.0 min/max/avg (ms): 1.0/1.0/1.0

Traceroute    New York – Boston
Source 138.120.15.90: vrf - VPN1    Destination    56.56.56.56
Seq     Destination     Delay (ms)
1       12.12.12.1      10,Node Unreachable,5
2       13.13.13.2      4,6,6
```

The following is exemplary of a corresponding CSV format file:

Ping, New York – Boston
Source,138.120.15.90: vrf - VPN1,Destination,13.13.13.2
Seq, Source, Destination, Delay (ms)
1, 138.120.15.90, 13.13.13.2,112
2, 138.120.15.90, 13.13.13.2,Node Unreachable
3, 138.120.15.90, 13.13.13.2,98
%Loss (ms),0.0
Jitter (ms),0.0
Min (ms),1.0
Max (ms),1.0
Avg (ms),1.0

Traceroute, New York – Boston
Source,138.120.15.90: vrf - VPN1,Destination, 13.13.13.2
Seq, Destination, Delay (ms)
1,12.12.12.1,10,Node Unreachable,5
2,13.13.13.2,4,6,6

[85] Historical results may be stored in the repository 512 containing results from every ping and traceroute connectivity verification job performed.

[86] Therefore, in accordance with the exemplary embodiment of the invention, verifying connectivity in a service provider IP/MPLS communications network in a network management context using an NMS system is addressed by:

- performing directed ping and traceroute connectivity verification tests between specified source and destination managed entities;
- performing connectivity verification tests between routers and IP Interfaces;
- performing connectivity verification tests via MPLS LSPs;
- performing connectivity verification tests within VPNs (VPN Routing and Forwarding (VRF) – VLAN ID labeled VPNs. See RFC 2547 L3VPN incorporated herein by reference.);
- performing connectivity verification tests between selected managed entities and unmanaged entities, such as, but not limited to routers; network addressing for unmanaged entities being discovered;
- scheduling multiple tests to verify connectivity periodically;
- scheduling the multiple tests to obtain for packet traffic statistics (delay, jitter, loss);
- configuring alarm thresholds on the multiple connectivity verification test schedule results to ensure service level agreements (SLA) are met; and

- highlighting failed or successful packet transport routes displayed 640 on the NMS system 504/506.

[87] In conclusion, the connectivity verification framework 500 enables operations management personnel interacting with the connectivity verification application 502 executing on the NMS system 510 in a centralized network management context to gather real-time connectivity information from a managed communications network for maintenance and diagnostics purposes.

[88] Advantages provided by the proposed solution include:

- A simple solution to implement on a Network Management System because provisioning of the connectivity verification tests are centralized and do not require manual logging-on the particular source managed entities.
- The solution provides schedule connectivity verification testing to be executed periodically, which saves operations management personnel time, thereby reducing a service provider's operating costs.
- The solution increases the reliability, availability and serviceability of the IP connectivity by providing immediate alarms and results to be summarize for later analysis.
- The solution enhances and simplifies the IP diagnostics and maintenance capability for solving service provider network problems. It also allows testing network provisioning prior to enabling a data service.
- Because the management is done through a GUI associated with the NMS system, the configuration is much easier than using the legacy CLI on a per source network node (router) basis, which is error prone.
- A further advantage includes being able to view/configure/modify/store the multiple network connectivity verification tests and provide the resulting information immediately (through views or alarms) or historically in a network management context.

[89] Reducing operating expenditures is important to service providers. The invention automates the diagnostics process of creating and maintaining connectivity tests, thereby reducing the operating costs of carrying out maintenance and diagnosis functions ensuring that IP connectivity meets the customer expectations as far a jitter, delay and loss of data. Furthermore, operating costs are reduced and reliability is increased, both of which are valuable to service providers.

[90] The embodiments presented are exemplary only and persons skilled in the art would appreciate that variations to the above described embodiments may be made without departing from the spirit of the invention. The scope of the invention is solely defined by the appended claims.

WE CLAIM:

1. A network management connectivity verification framework comprising:

a. a connectivity verification server performing unattended connectivity verification jobs; and

b. a connectivity verification application for defining connectivity verification jobs, configuring the connectivity verification server accordingly, and displaying configuration verification results.

2. A connectivity verification framework claimed in claim 1, wherein the connectivity verification jobs are scheduled and the connectivity verification server performs scheduled connectivity verification.

3. A connectivity verification framework claimed in claim 1, wherein the connectivity verification application further providing a display of connectivity verification results.

4. A connectivity verification framework claimed in claim 1, wherein the results of each connectivity verification job may be compared against a connectivity profile, a deviation from the connectivity profile being used to raise an alarm.

5. A connectivity verification framework claimed in claim 3, wherein the connectivity verification results, including alarm information, are further used to generate a network map displaying selected connectivity verification results.

6. A method of creating a network connectivity verification test, comprising steps of:

a. defining a connectivity verification job;

b. configuring a connectivity verification server to perform the connectivity verification job; and

c. displaying connectivity verification results.

7. The method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises steps of:

a. selecting via an NMS user interface, a pair of source and destination IP objects between which connectivity is to be verified; and

b. specifying a connectivity verification schedule;

8. The method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises a step of specifying connectivity verification thresholds to be applied against connectivity verification results.

9. The method of creating a network connectivity verification test claimed in claim 8, wherein specifying connectivity thresholds further comprises specifying a threshold for a round trip delay, jitter, and packet loss.

10. The method of creating a network connectivity verification test claimed in claim 7, wherein a selected IP object include one of a router, IP interface, and IP address.

11. The method of creating a network connectivity verification test claimed in claim 7, wherein the pair of IP objects is selected selecting one of an IP link, an LSP, and a VPN.

12. The method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises a step of: configuring a connectivity verification parameter including one of a number of ping commands to issue, a ping packet size, ping data fill pattern, a time to wait for response, and a type of service.

13. The method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises a step of: configuring a connectivity verification parameter including one of a number of traceroute commands to issue, a traceroute packet size, traceroute packet data fill pattern, a time to wait for response, and a type of service.

14. A method of performing a network connectivity verification in a network management context comprising steps of:

a. performing scheduled connectivity verification;

b. comparing a connectivity verification result with a threshold; and

c. raising an alarm if the connectivity verification result has reached the threshold.

15. The method of performing a network connectivity verification claimed in claim 14, further comprising a step of: storing connectivity verification job on computer readable medium for subsequent access and execution.

16. The method of performing a network connectivity verification claimed in claim 14, further comprising a step of: highlighting at least one IP object based on one of a connectivity verification job and a connectivity verification result.

17. The method of performing a network connectivity verification claimed in claim 16, wherein a highlighted object is one of an OSI Layer 2 and OSI Layer 3 object.

18. The method of performing a network connectivity verification claimed in claim 14, wherein performing scheduled connectivity verification the method further comprising a step of: periodically executing connectivity verification tests.

19. The method of performing a network connectivity verification claimed in claim 14, wherein performing scheduled connectivity verification the method further comprising a step of: issuing a one of a ping command and traceroute command.

20. The method of performing a network connectivity verification claimed in claim 14, further comprising a step of: storing historical connectivity verification results on computer readable medium for subsequent access.

Abstract

A framework for connectivity verification is provided. The framework includes a connectivity verification server performing unattended connectivity verification, and a connectivity verification application, both the connectivity verification server and connectivity verification application operating in a network management context. Connectivity verification jobs are defined via the connectivity verification application and the connectivity verification server is configured accordingly. Connectivity verification jobs can also be scheduled. The connectivity verification application also provides a display of connectivity verification results. The results of each connectivity verification job may be compared against a desired connectivity profile and deviations from the connectivity profile being used to raise alarms. Connectivity verification results, including alarm information, are further used to highlight displayed managed communications network entities on a network map displaying selected connectivity verification results. The advantages are derived from using the connectivity verification framework to automate connectivity verification testing at reduced operational costs.

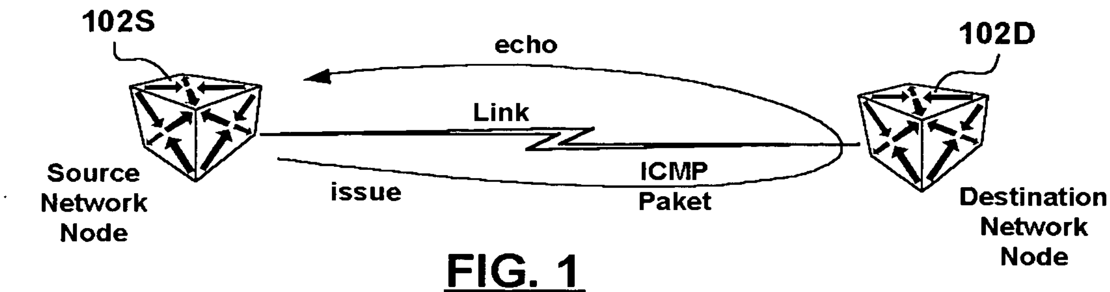


FIG. 1
PRIOR ART

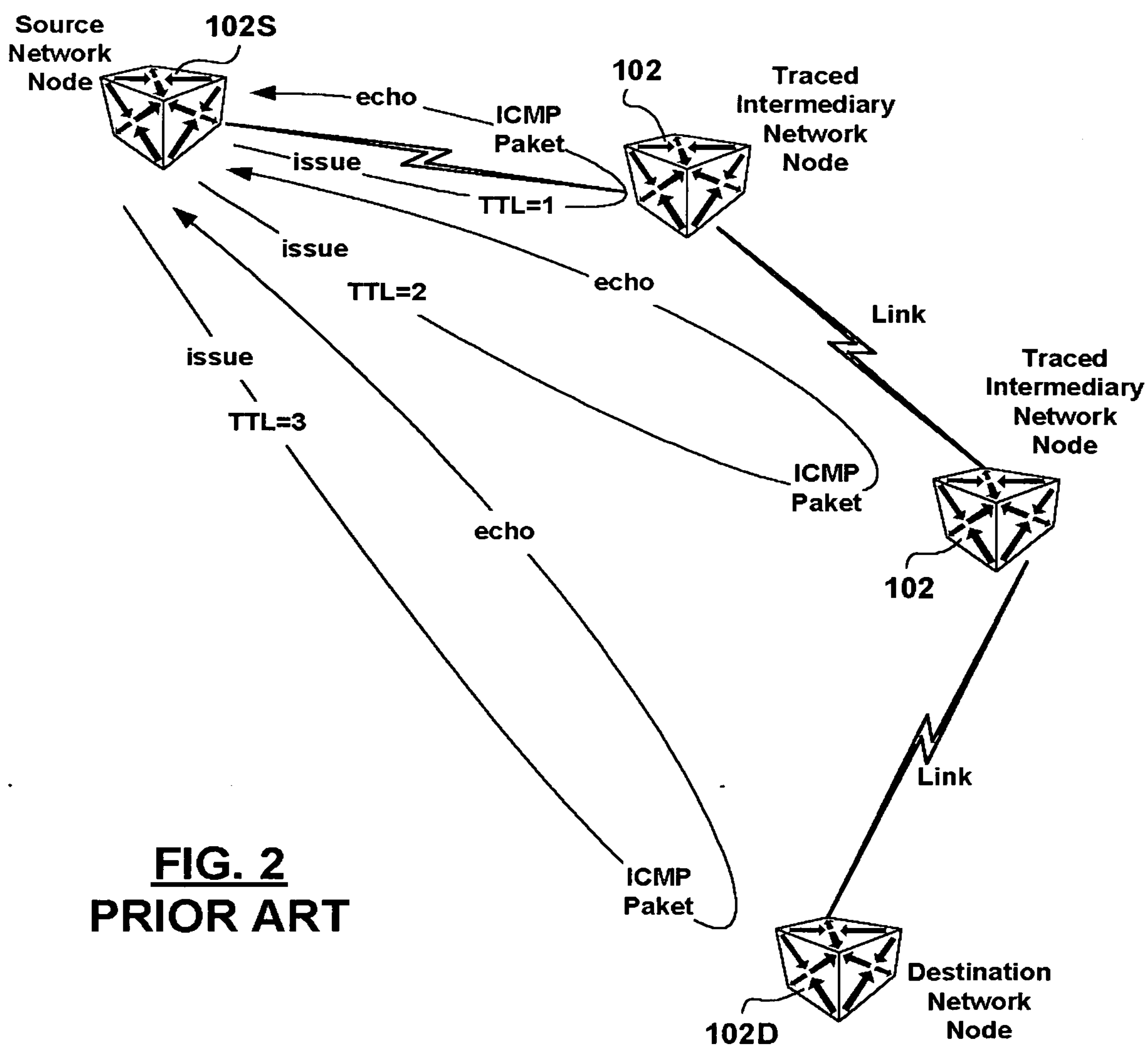


FIG. 2
PRIOR ART

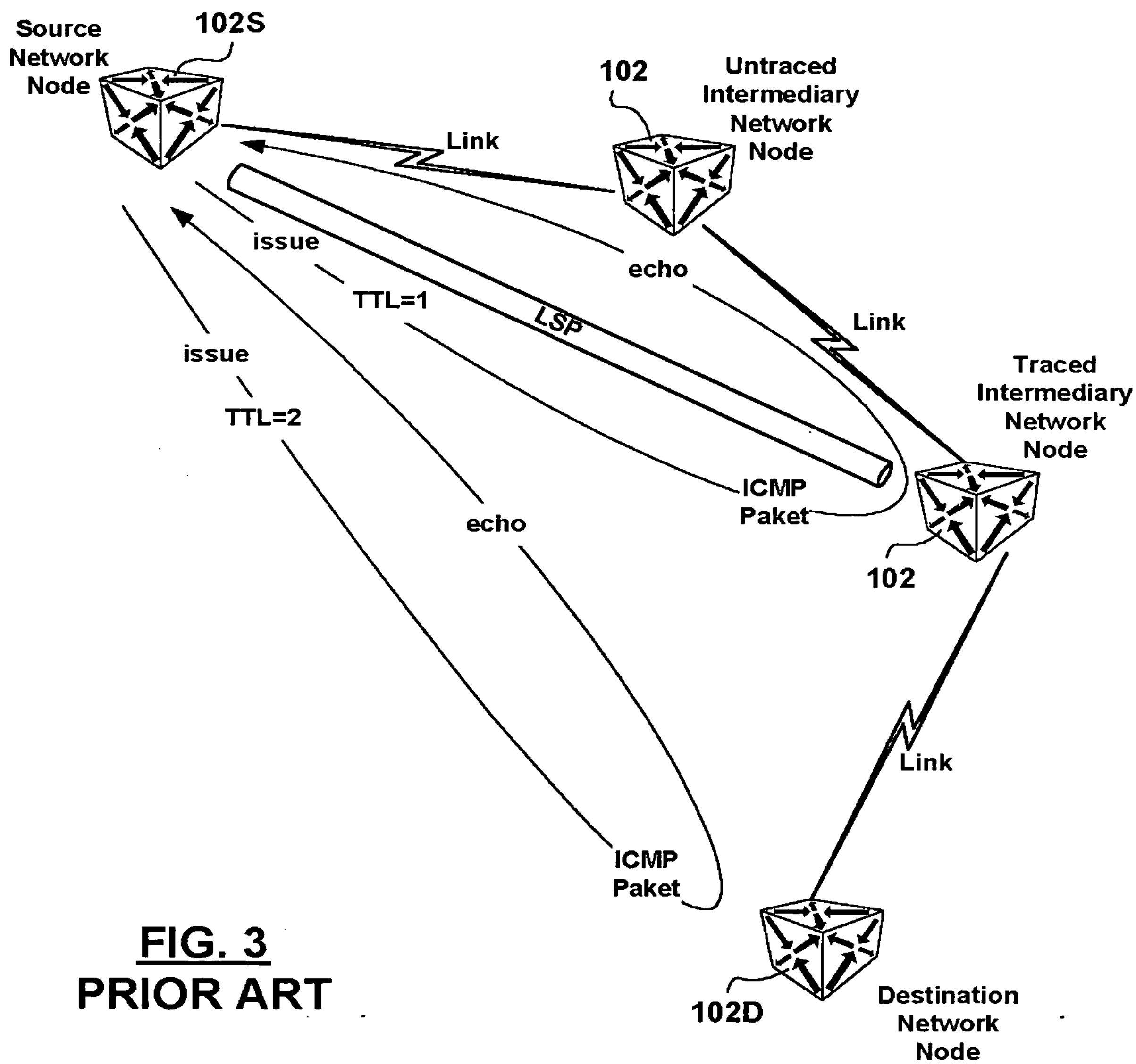


FIG. 3
PRIOR ART

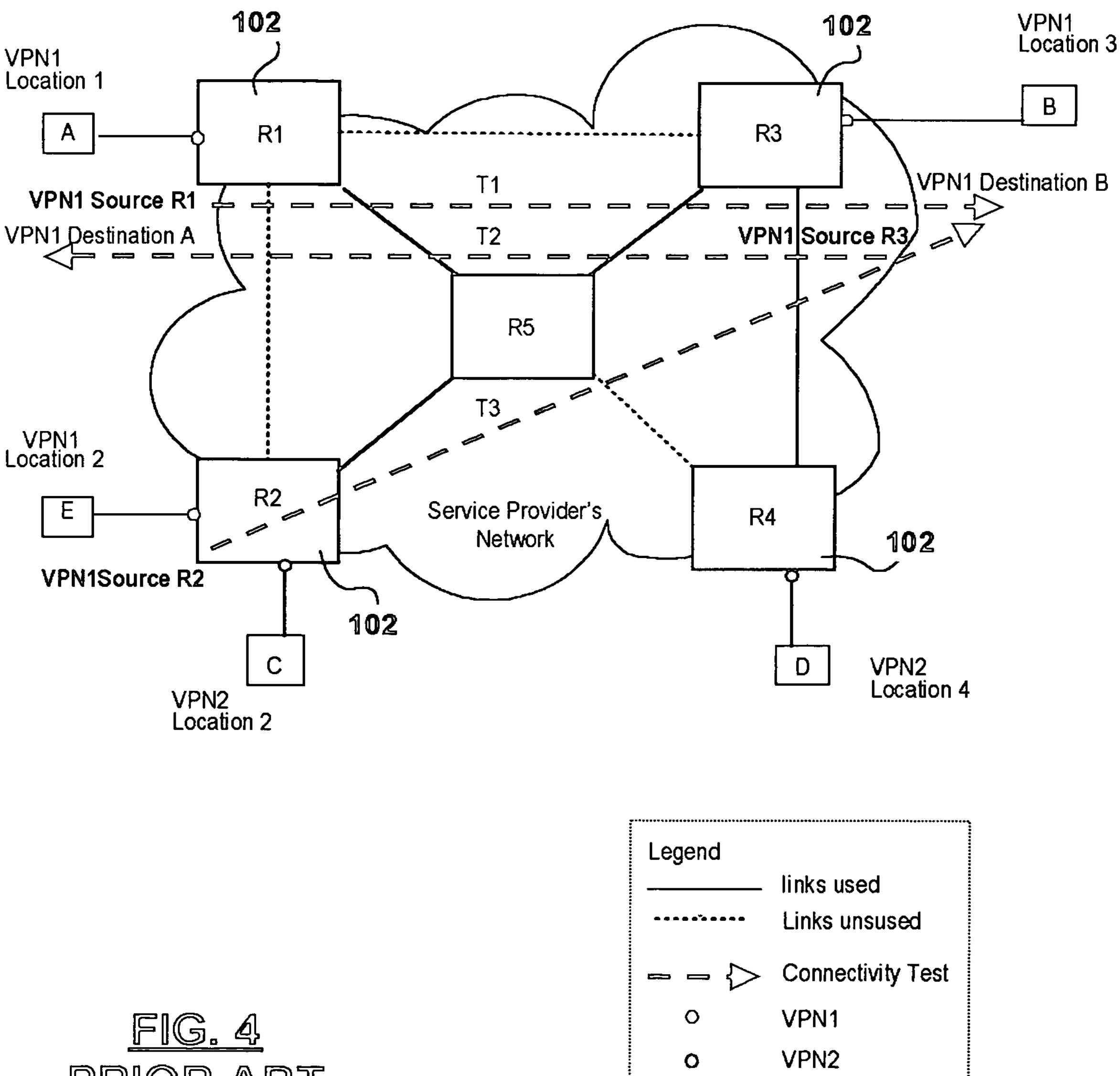
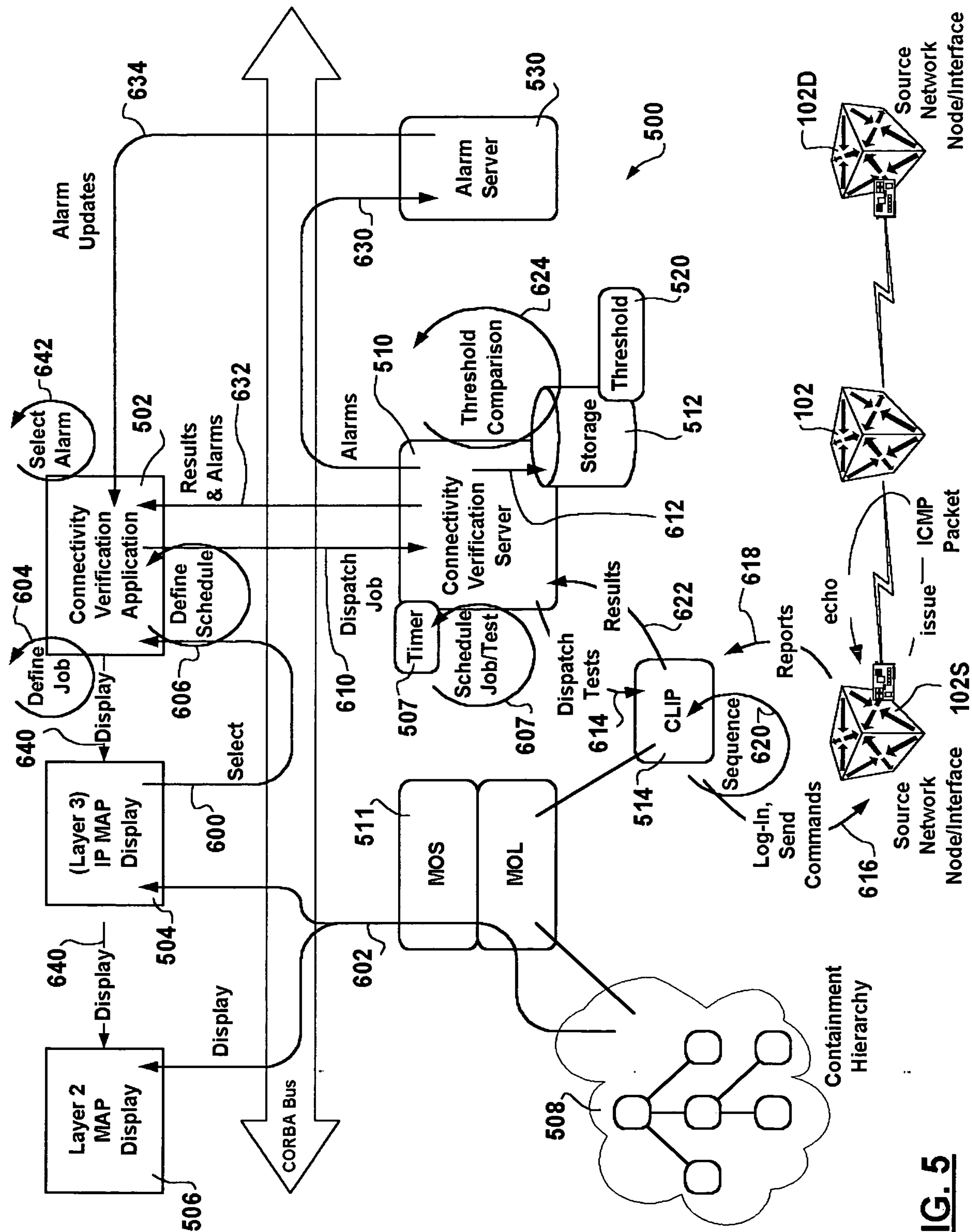


FIG. 4
PRIOR ART



Alarm Updates
634
Select Alarm
642
502
Results & Alarms
632
Alarms
510
Threshold Comparison
624
Alarm Server
530
630
500
Connectivity Verification Application
Define Schedule
604
Define Job
Display
640
606
Dispatch Job
610
Connectivity Verification Server
Storage
512
Threshold
520
612
Timer
507
Schedule Job/Test
607
Dispatch Tests
614
Results
622
CLIP
Sequence
620
618
Reports
514
Log-In, Send Commands
616
(Layer 3) IP MAP Display
Select
600
511
MOS
MOL
504
602
Layer 2 MAP Display
506
CORBA Bus
508
Containment Hierarchy
102D
Source Network Node/Interface
102
echo
issue
ICMP Packet
102S

FIG. 5

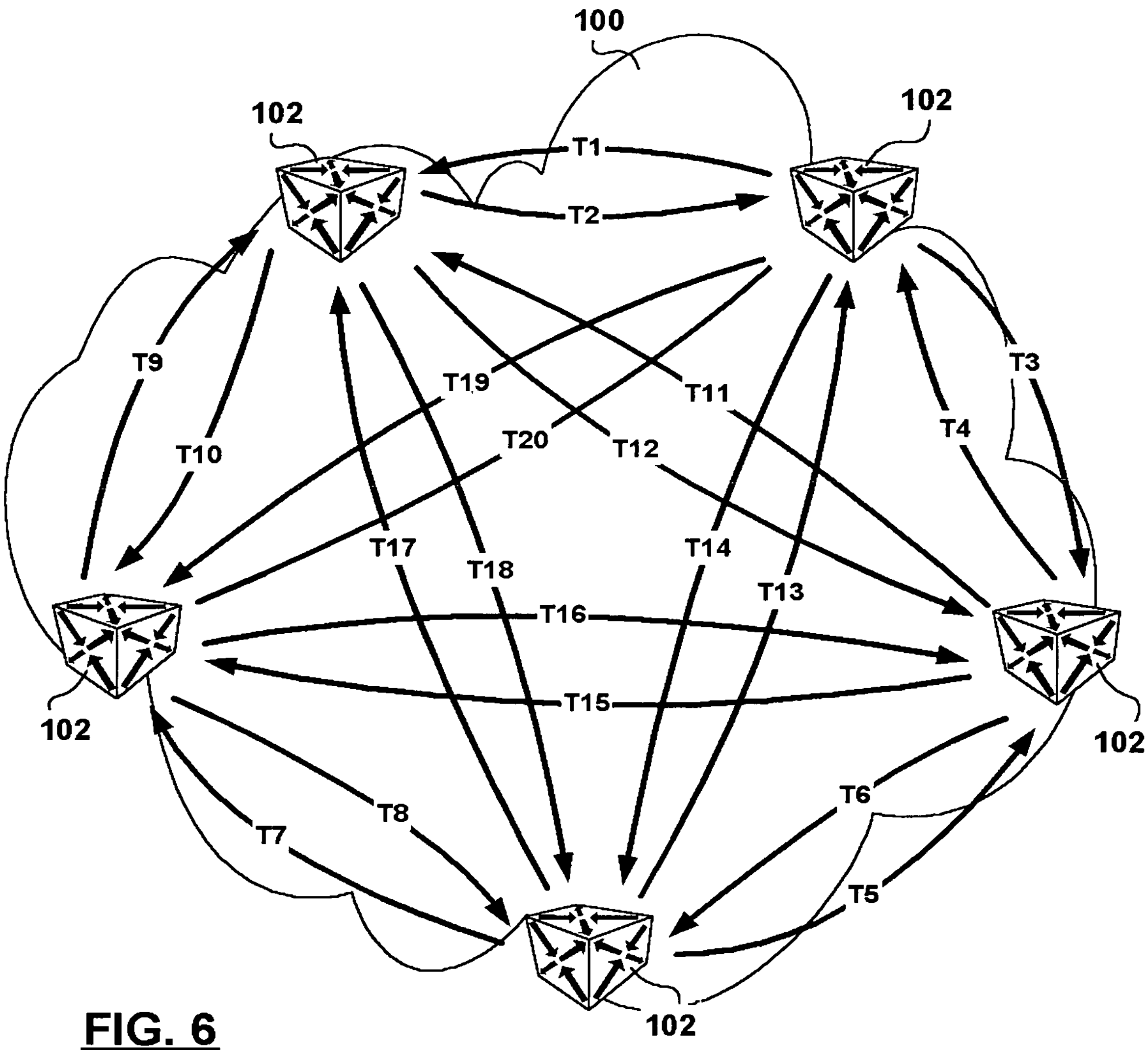
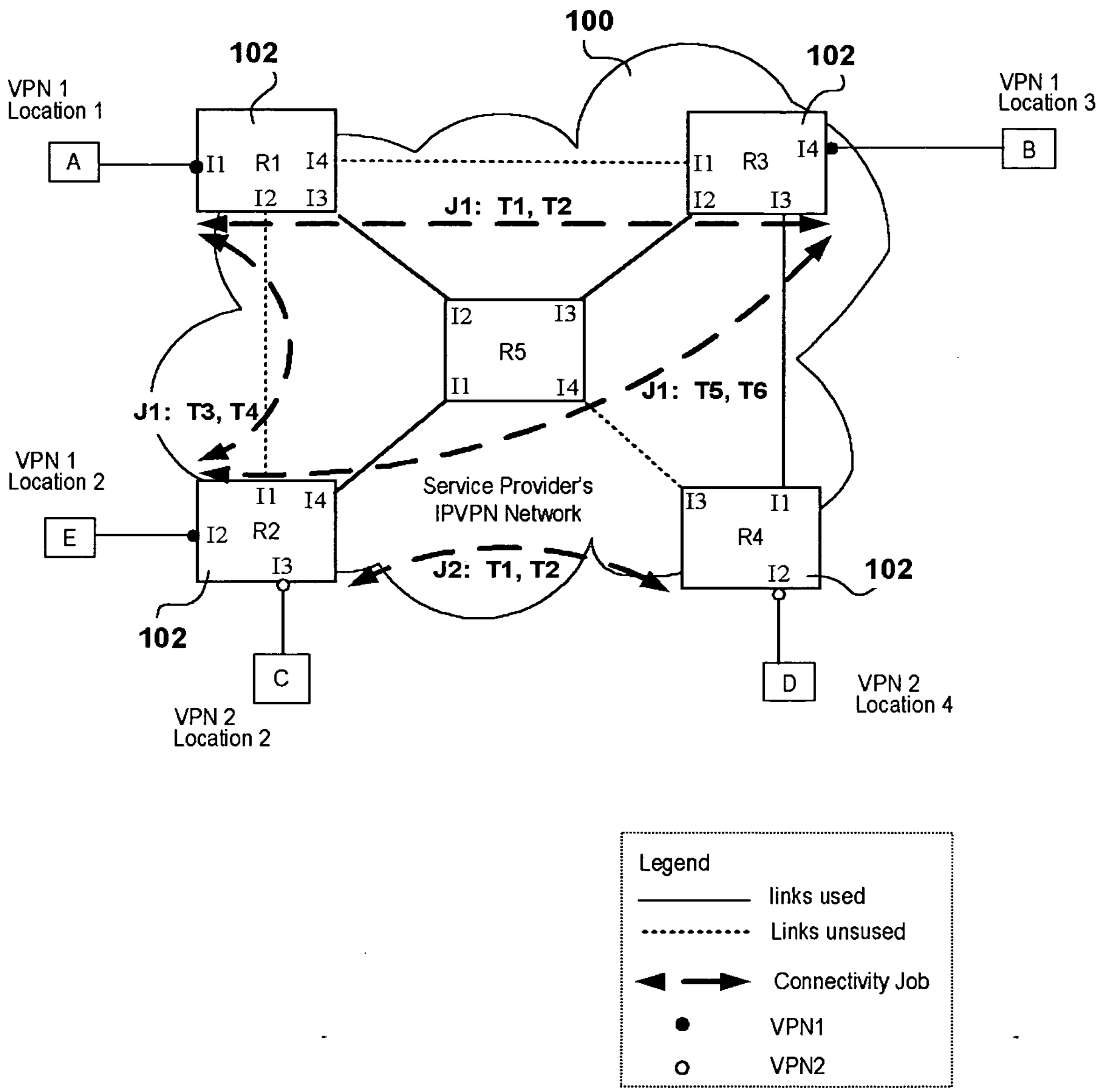

100
102
102
102
102
102
T1
T2
T3
T4
T5
T6
T7
T8
T9
T10
T11
T12
T13
T14
T15
T16
T17
T18
T19
T20

FIG. 6



100
102
102
102
102
VPN 1
Location 1
VPN 1
Location 3
VPN 1
Location 2
VPN 2
Location 2
VPN 2
Location 4
A
B
C
D
E
R1
I1
I2
I3
I4
R3
I1
I2
I3
I4
R5
I1
I2
I3
I4
R2
I1
I2
I3
I4
R4
I1
I2
I3
J1: T1, T2
J1: T3, T4
J1: T5, T6
J2: T1, T2
Service Provider's
IPVPN Network
Legend
links used
Links unsused
Connectivity Job
VPN1
VPN2

FIG. 7

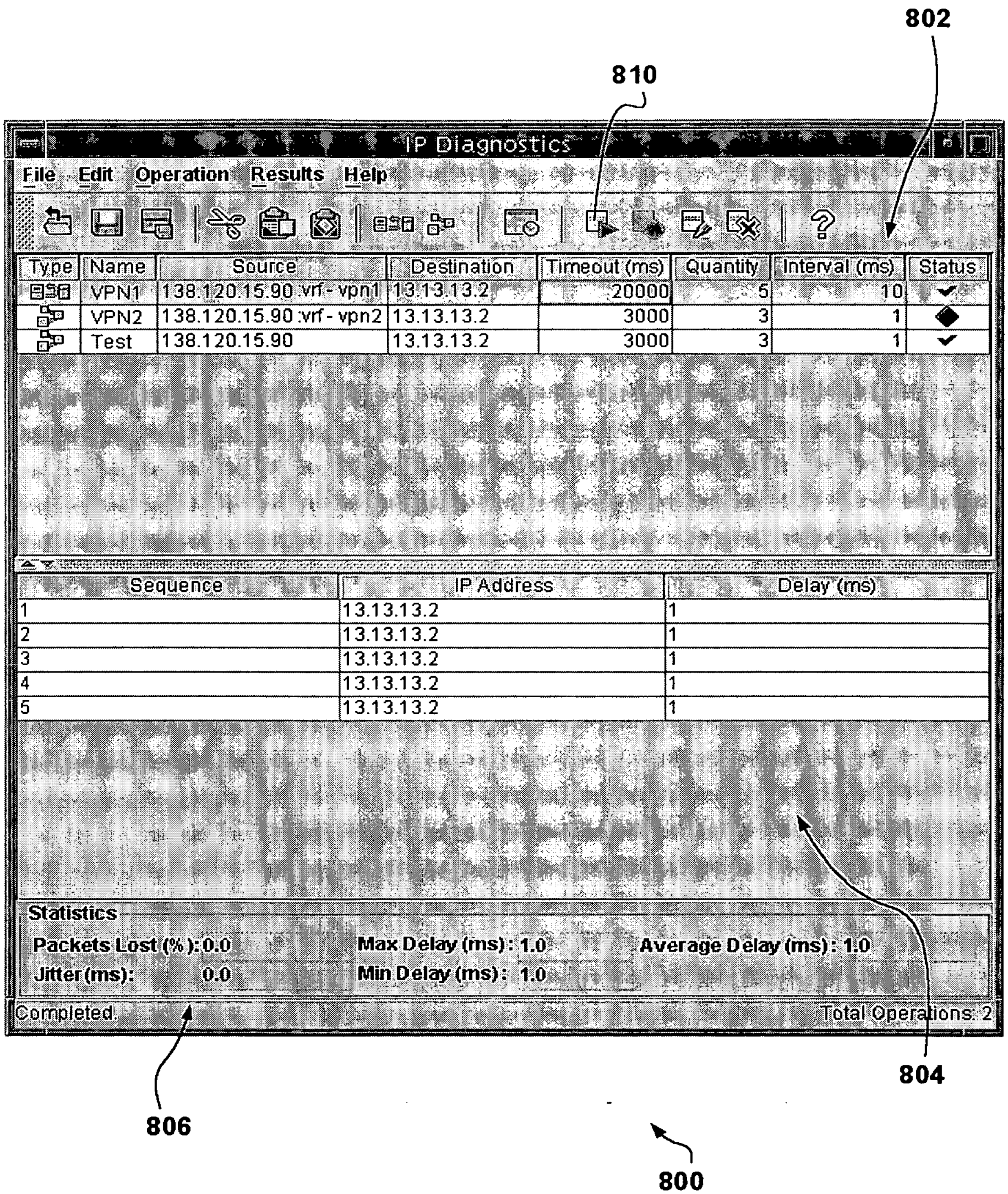

802
810
IP Diagnostics
File Edit Operation Results Help
Type Name Source Destination Timeout (ms) Quantity Interval (ms) Status
VPN1 138.120.15.90 :vrf - vpn1 13.13.13.2 20000 5 10
VPN2 138.120.15.90 :vrf - vpn2 13.13.13.2 3000 3 1
Test 138.120.15.90 13.13.13.2 3000 3 1
Sequence IP Address Delay (ms)
1 13.13.13.2 1
2 13.13.13.2 1
3 13.13.13.2 1
4 13.13.13.2 1
5 13.13.13.2 1
Statistics
Packets Lost (%): 0.0
Jitter (ms): 0.0
Max Delay (ms): 1.0
Min Delay (ms): 1.0
Average Delay (ms): 1.0
Completed.
Total Operations: 2
804
806
800

FIG. 8

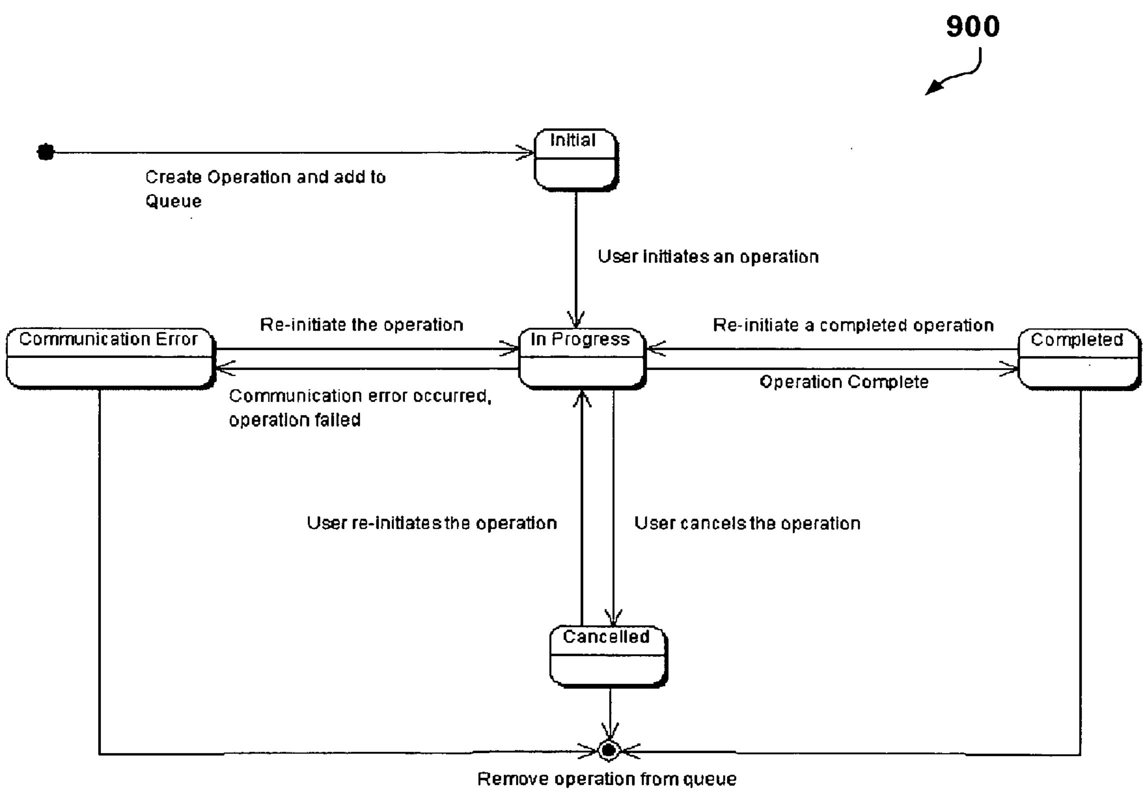

900
Initial
Create Operation and add to Queue
User Initiates an operation
Communication Error
Re-initiate the operation
In Progress
Re-initiate a completed operation
Completed
Communication error occurred, operation failed
Operation Complete
User re-initiates the operation
User cancels the operation
Cancelled
Remove operation from queue

FIG. 9

1000

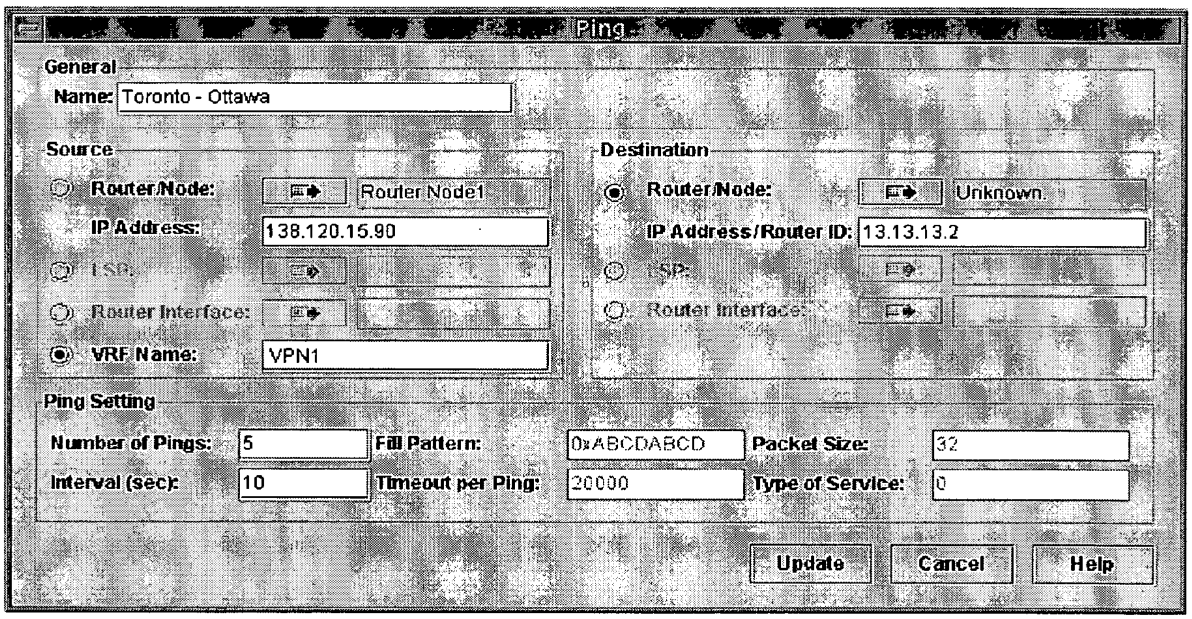

Ping
General
Name: Toronto - Ottawa
Source
Router/Node: Router Node1
IP Address: 138.120.15.90
LSP:
Router Interface:
VRF Name: VPN1
Destination
Router/Node: Unknown
IP Address/Router ID: 13.13.13.2
LSP:
Router Interface:
Ping Setting
Number of Pings: 5
Fill Pattern: 0xABCDABCD
Packet Size: 32
Interval (sec): 10
Timeout per Ping: 20000
Type of Service: 0
Update
Cancel
Help

FIG. 10

1100

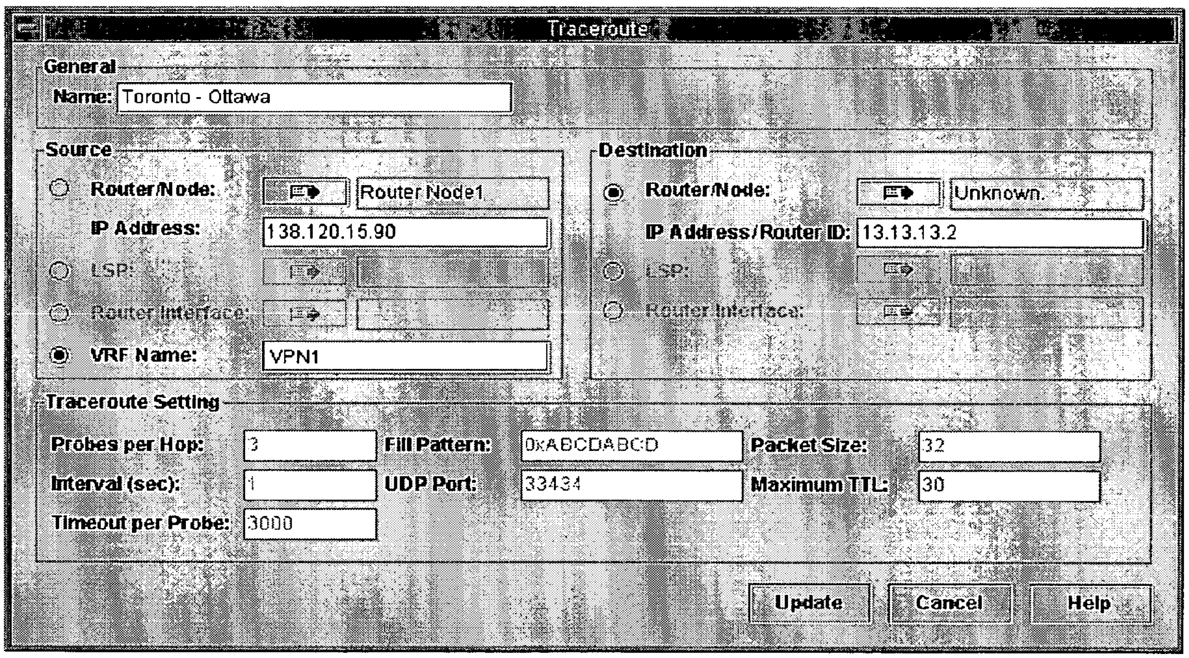

Traceroute
General
Name: Toronto - Ottawa
Source
Router/Node:
Router Node1
IP Address:
138.120.15.90
LSP:
Router Interface:
VRF Name:
VPN1
Destination
Router/Node:
Unknown.
IP Address/Router ID:
13.13.13.2
LSP:
Router Interface:
Traceroute Setting
Probes per Hop:
3
Fill Pattern:
0xABCDABCD
Packet Size:
32
Interval (sec):
1
UDP Port:
33434
Maximum TTL:
30
Timeout per Probe:
3000
Update
Cancel
Help

FIG. 11

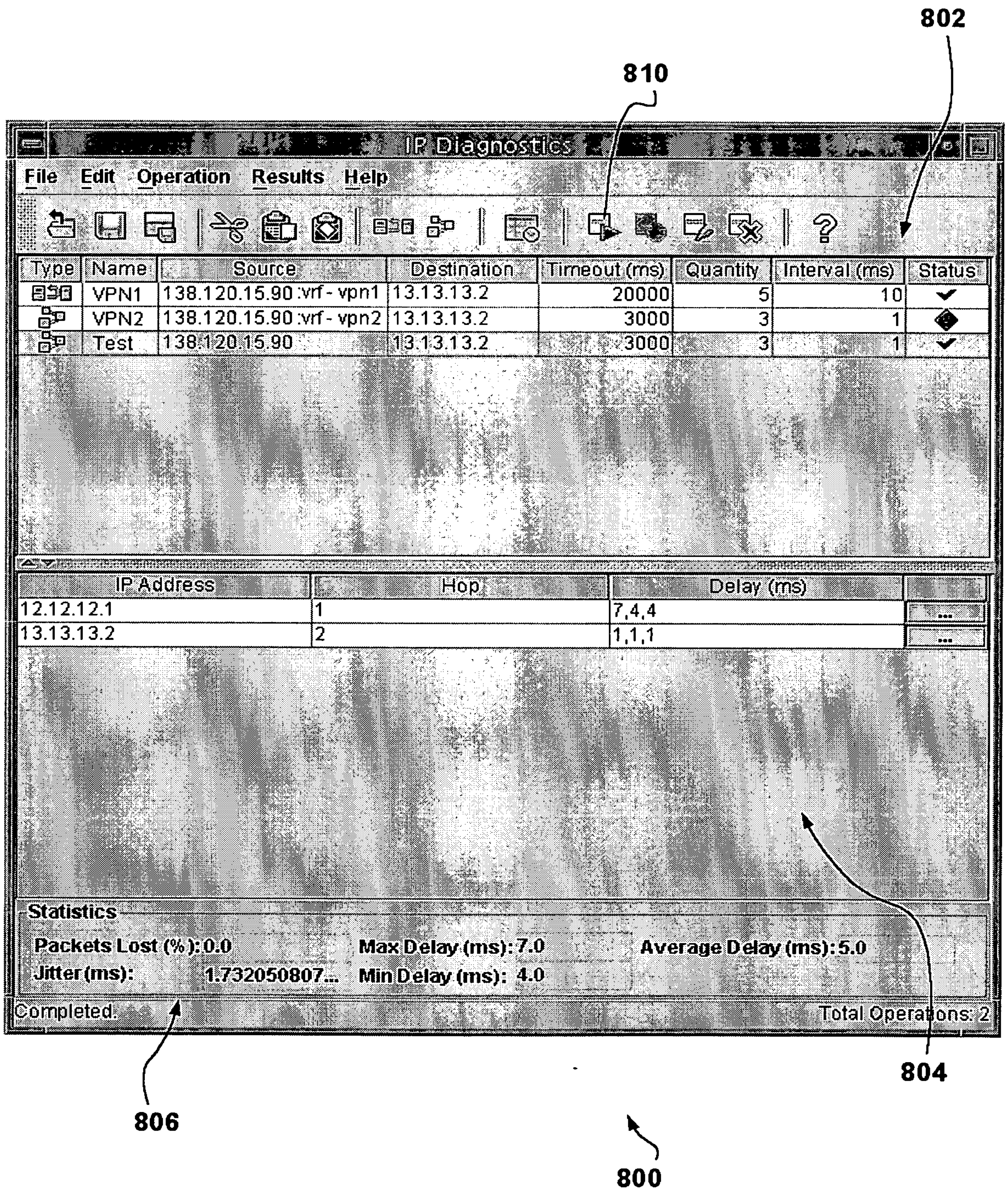

802
810
IP Diagnostics
File Edit Operation Results Help
Type Name Source Destination Timeout (ms) Quantity Interval (ms) Status
VPN1 138.120.15.90 :vrf - vpn1 13.13.13.2 20000 5 10
VPN2 138.120.15.90 :vrf - vpn2 13.13.13.2 3000 3 1
Test 138.120.15.90 13.13.13.2 3000 3 1
IP Address Hop Delay (ms)
12.12.12.1 1 7,4,4
13.13.13.2 2 1,1,1
Statistics
Packets Lost (%): 0.0
Max Delay (ms): 7.0
Average Delay (ms): 5.0
Jitter (ms): 1.732050807...
Min Delay (ms): 4.0
Completed.
Total Operations: 2
804
806
800

FIG. 12

1300

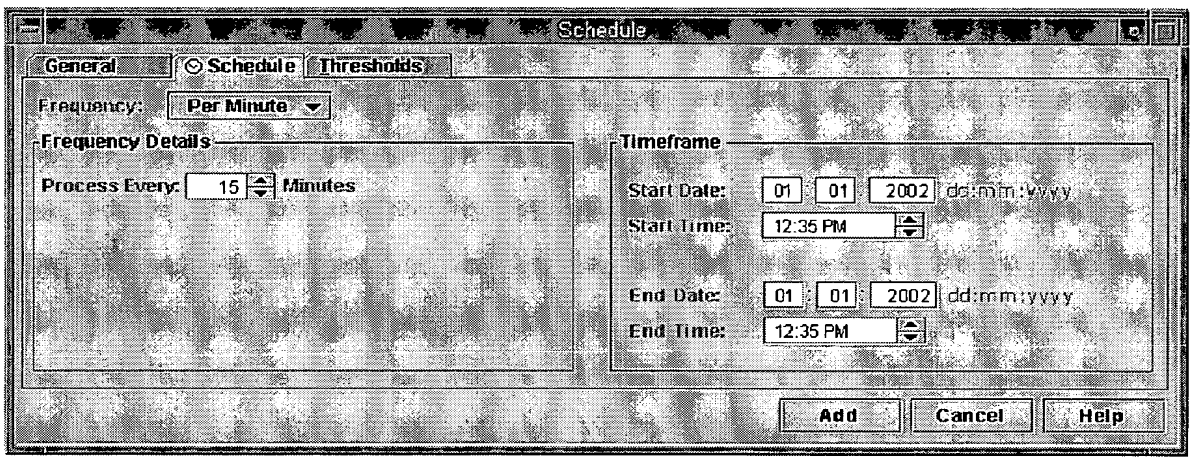

Schedule
General
Schedule
Thresholds
Frequency:
Per Minute
Frequency Details
Process Every:
15
Minutes
Timeframe
Start Date:
01
01
2002
dd:mm:yyyy
Start Time:
12:35 PM
End Date:
01
01
2002
dd:mm:yyyy
End Time:
12:35 PM
Add
Cancel
Help

FIG. 13

1400

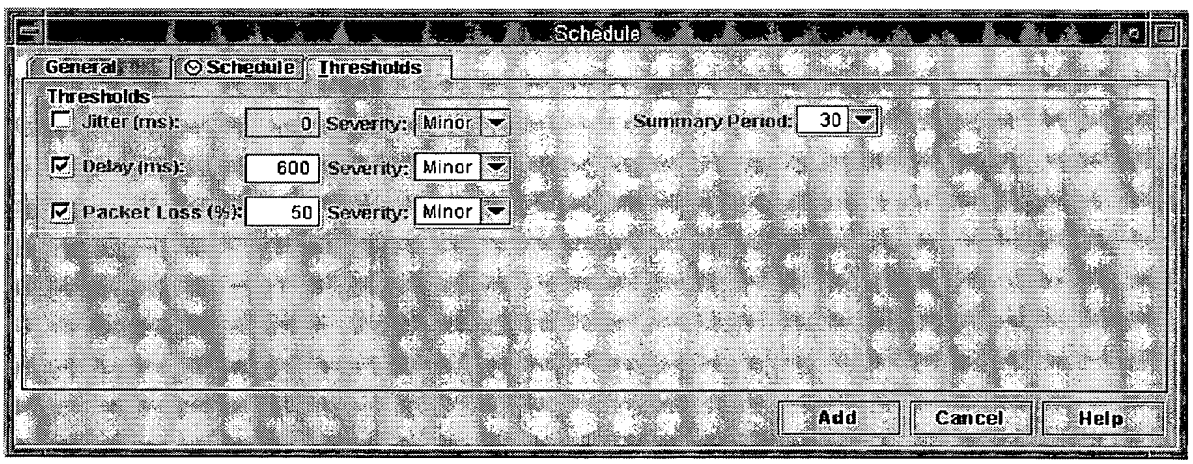

Schedule
General
Schedule
Thresholds
Thresholds
Jitter (ms):
0
Severity:
Minor
Summary Period:
30
Delay (ms):
600
Severity:
Minor
Packet Loss (%):
50
Severity:
Minor
Add
Cancel
Help

FIG. 14

DECLARATION AND POWER OF ATTORNEY FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63) ☒ Declaration Submitted with Initial Filing. ☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16(e)) required).	Attorney Docket No.: 137678-US First Named Inventor: Denis Armand Proulx COMPLETE IF KNOWN Application Number: Filing Date: Group Art Unit: Examiner Name:

As a below named inventor, I hereby declare that:

My residence, mailing address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

CENTRALIZED INTERNET PROTOCOL / MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT

the specification of which
☒ is attached hereto.
☐ was filed on ______ as United States Application Serial No. ______ or PCT International Application No. and was amended on ______ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

Foreign Application(s) and/or Claim of Foreign Priority
I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or any PCT international application having a filing date before that of the application on which priority is claimed.

Country	Application Number	Date Filed	Priority Claimed Under 35 U.S.C. §119
Canada	2,425,442	April 15, 2003	☒ Yes ☐ No
			☐ Yes ☐ No

Provisional Application
I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below:

Application Serial Number	Filing Date

U.S. Priority Claim
I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

Application Serial Number	Filing Date	Status - Patented/Pending/Abandoned

POWER OF ATTORNEY

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: John Granchelli Registration No. 39,512
Greg Benoit Registration No. 48,067

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CANADA

Direct telephone calls to: John Granchelli Phone (613) 784-6523 Fax (613) 784-8923

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: **Denis Armand Proulx**

Sole or first inventor's signature: Denis Proulx Date: 6/APRIL/2004.
Residence: City **Kanata** State **Ontario, Canada** Citizenship: **Canada**
Mailing Address: **1435 Houston Crescent, Kanata, Ontario, K2W 1B6**

Full name of second inventor, if any: **Craig Ellirt Timmerman**

Second inventor's signature: Craig Timmerman Date: 6/April/2004
Residence: City **Ottawa** State **Ontario, Canada** Citizenship: **Canada**
Mailing Address: **704 Parkdale Avenue, Ottawa, Ontario, K1Y 1J3, Canada**

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Third inventor's signature: ______ Date: 6/April/2004
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Mailing Address: **1147 Ambleside Drive, Ottawa, Ontario, K2B 8E2, Canada**

Full name of fourth inventor, if any: **Margaret Rachniowski**

Fourth inventor's signature: M Rachniowski Date: 6th April 2004
Residence: City **Nepean** State **Ontario, Canada** Citizenship: **Canada**
Mailing Address: **5 Burdock Grove, Nepean, Ontario, K2R 1A1, Canada**

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Fifth inventor's signature: ______ Date: 2004/04/06 A.Z
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Mailing Address: **1194 Klondike Road, Kanata, Ontario, K2K 1X7, Canada**

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Sixth inventor's signature: Mac Virdy Date: April 7, 2004
Residence: City **Ottawa** State **Ontario, Canada** Citizenship: **Canada**
Mailing Address: **PH 18 - 169 Lees Avenue, Ottawa, Ontario, K1S 5M2, Canada**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re. Application of: Denis Armand Proulx et al
Serial No.:
Filed:
Title: CENTRALIZED INTERNET PROTOCOL / MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT

Atty. Docket No.: 137678-US

The Commissioner of Patents and Trademarks
Washington, D.C. 20231
U.S.A.

ASSOCIATE POWER OF ATTORNEY

Dear Sir:

The undersigned, John Granchelli (Reg. No. 39,512), is an agent of record for the captioned U.S. Patent Application under a Power of Attorney filed with the U.S. Patent Office contemporaneously herewith.

Pursuant to 37 CFR Section 1.34(b), the undersigned hereby appoints the following registered practitioners as associate agents of record:

Terry W. Kramer	Reg. No. 41,541
Arlir M. Amado	Reg. No. 51,399
Thomas Powers	Reg. No. 38,582
Tyler S. Brown	Reg. No. 36,465

to prosecute said application and to transact all business in the U.S. Patent and Trademark Office connected therewith. The appointment of the above practitioners does not affect, and is not intended to affect, the status of any other practitioner who has been appointed previously as agent of record for this matter.

Please direct any and all correspondence and telephone calls to:

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Attn: Terry W. Kramer, Esq.
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2001 Jefferson Davis Highway, Suite 1101
Arlington, Virginia 22202
Customer Number 30868

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Fax: (703) 413-5048

Respectfully submitted,

APRIL 7/04
Date

John Granchelli

John Granchelli
Reg. No. 39,512

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600 March Road
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Telephone: 613-784-6523
Facsimile: 613-784-8923

APPLICATION DATA SHEET

Application Information

Application Number::	New
Filing Date::	04/08/04
Application Type::	Regular
Subject Matter::	Utility
Suggested Classification::	None
Suggested Group Art Unit::	None
CD-ROM or CD-R?::	None
Title::	CENTRALIZED INTERNET PROTOCOL/MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT
Attorney Docket Number::	ALC 3125
Request for Early Publication?::	No
Suggested Drawing Figure::	None
Total Drawing Sheets::	13
Small Entity?::	No
Petition Included?::	No
Licensed US Govt. Agency::	None

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State or Province of Mailing Address::	Ontario
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Country of Residence::	Canada
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City of Mailing Address::	Ottawa
State or Province of Mailing Address::	Ontario
Country of Mailing Address::	Canada
Postal or Zip Code of Mailing Address::	K1Y 1J3
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Primary Citizenship Country::	Canada
Status::	Full Capacity
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Middle Name::	
Family Name::	Katz

Name Suffix::	
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State or Province of Residence::	ON
Country of Residence::	Canada
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City of Mailing Address::	Ottawa
State or Province of Mailing Address::	Ontario
Country of Mailing Address::	Canada
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Primary Citizenship Country::	Canada
Status::	Full Capacity
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Middle Name::	
Family Name::	Rachinowski
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City of Residence::	Nepean
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Country of Residence::	Canada
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City of Mailing Address::	Nepean
State or Province of Mailing Address::	Ontario
Country of Mailing Address::	Canada
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Primary Citizenship Country::	Canada
Status::	Full Capacity
Given Name::	Afshan

Middle Name::	
Family Name::	Zabihi
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State or Province of Residence::	ON
Country of Residence::	Canada
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City of Mailing Address::	Kanata
State or Province of Mailing Address::	Ontario
Country of Mailing Address::	Canada
Postal or Zip Code of Mailing Address::	K2K 1X7
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Primary Citizenship Country::	Canada
Status::	Full Capacity
Given Name::	Macmohana
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Family Name::	Virdy
Name Suffix::	
City of Residence::	Ottawa
State or Province of Residence::	ON
Country of Residence::	Canada
Street Mailing Address::	PH 18 169 Lees Avenue
City of Mailing Address::	Ottawa
State or Province of Mailing Address::	Ontario
Country of Mailing Address::	Canada
Postal or Zip Code of Mailing Address::	K1S 5M2

Application No.: New
Attorney Docket No.: ALC 3125

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Fax Number::	703-413-5048
E-mail address::	terry@kramerip.com

Representative Information

Representative Customer Number::	30868

Domestic Priority Information

Application::	Continuity Type::	Parent Application::	Parent Filing Date::

Foreign Priority Information

Country::	Application number::	Filing Date::	Priority Claimed::
Canada	2,425,442	04/15/03	Yes

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City of Mailing Address::	Paris
Country of Mailing Address::	France
Postal or Zip Code of Mailing Address::	75008

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	:	Denis Armand Proulx, et al.
For:	:	CENTRALIZED INTERNET PROTOCOL/MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT
Serial No.	:	New
Filed	:	April 8, 2004
Art Unit	:	Unassigned
Examiner	:	Unassigned
Attorney Docket No.	:	ALC 3125

Assistant Commissioner for Patents
Washington, D.C. 20231

INFORMATION DISCLOSURE STATEMENT

Dear Sir:

This Information Disclosure Statement is submitted:

X under 37 CFR 1.97(b), or
(Within three months of filing national application; or date of entry of international application; or before mailing date of first office action on the merits; whichever occurs last)

__ under 37 CFR 1.97(c) together with either a:
__ Certification under 37 CFR 1.97(e), or
__ a $180.00 fee under 37 CFR 1.17(p), or
(After the CFR 1.97(b) time period, but before final action or notice of allowance, whichever occurs first)

__ under 37 CFR 1.97(d) together with a:
__ Certification under 37 CFR 1.97(e), and

__ a petition under 37 CFR 1.97(d)(2)(ii), and
__ a $180.00 petition fee set forth in 37 CFR 1.17(i)(1).
(Filed after final action or notice of allowance, whichever occurs first, but before payment of the issue fee)

_X_ Applicants submit herewith Form PTO/SB/08A Information Disclosure Statement by Applicant together with copies, of patents, publications or other information of which applicants are aware, which applicants believe may be material to the examination of this application and for which there may be a duty to disclose in accordance with 37 CFR 1.56.

The relevance of the attached references is that this is the closest art of which Applicants are aware.

Applicants submit that the above references taken alone or in combination neither anticipate nor render obvious the present invention. Consideration of the foregoing in relation to this application is respectfully requested.

It is requested that the information disclosed herein be made of record in this application.

In the event that the fees submitted prove to be insufficient in connection with the filing of this paper, please charge our Deposit Account Number 50-0578 and please credit any excess fees to such Deposit Account.

Respectfully submitted,
KRAMER & AMADO, P.C.

Date: April 8, 2004

Terry W. Kramer
Terry W. Kramer
Reg. No. 41,541

KRAMER & AMADO, P.C.
Crystal Plaza One
2001 Jefferson Davis Highway
Suite 1101
Arlington, Virginia 22202
Telephone No.: (703) 413-5000
Facsimile No: (703) 413-5048

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	New
Filing Date	April 8, 2004
First Named Inventor	Denis Armand Proulx
Art Unit	Unassigned
Examiner Name	Uassigned
Attorney Docket Number	ALC 3125

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	US- 5,974,237	10/26/1999	Shurmer	
	2	US- 6,205,122	03/20/2001	Sharon	
	3	US- 6,222,827	04/24/2001	Grant	
	4	US- 6,397,248	05/28/2002	Iyer	
	5	US- 6,405,248	06/11/2002	Wood	
	6	US- 6,502,130	12/31/2002	Keeler, Jr.	
		US-			
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3]-Number[4]-Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

PATENT APPLICATION FEE DETERMINATION RECORD
Effective October 1, 2003

Application or Docket Number
10820111

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	20	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	20 minus 20=	* —
INDEPENDENT CLAIMS	3 minus 3 =	* —
MULTIPLE DEPENDENT CLAIM PRESENT		☐

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐ OR OTHER THAN SMALL ENTITY

RATE	FEE		RATE	FEE
BASIC FEE	385.00	OR	BASIC FEE	770.00
X$ 9=		OR	X$18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL		OR	TOTAL	770

CLAIMS AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

SMALL ENTITY OR OTHER THAN SMALL ENTITY

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM				☐

RATE	ADDITIONAL FEE		RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

PATENT APPLICATION SERIAL NO. ______________________

U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE
FEE RECORD SHEET

04/12/2004 HMARZI1 00000013 10820111

01 FC:1001 770.00 OP

PTO-1556
(5/87)

*U.S. Government Printing Office: 2002 — 489-267/69033

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KRAMER & AMADO, P.C.
PATENT RESEARCH SERVICES
INTELLECTUAL PROPERTY LAW

1725 DUKE STREET
SUITE 240
ALEXANDRIA, VIRGINIA 22314
PHONE: (703) 519-9801
FACSIMILE: (703) 519-9802

WWW.KRAMERIP.COM

Fax Memo

TO:	Mail Stop Amendment USPTO
FAX NO.:	(571) 273-8300
FROM:	Terry W. Kramer KRAMER & AMADO, P.C.
DATE:	July 18, 2005
SUBJECT:	U.S. Patent Application Title: CENTRALIZED INTERNET PROTOCOL/MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT Serial No.: 10/820,111 Attorney Docket No.: ALC 3125
PAGES:	INCLUDING COVER PAGE (4)

Message: Submitted herewith are the following:

- Transmittal Form
- Change of Address (2 pages)

In the event that the fees submitted herewith are insufficient, please charge any remaining balance, or credit any overpayment, to our Deposit Account Number 50-0578.

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JUL-18-2005 12:47 KRAMER & AMADO, P.C. 703 5199802 P.02/04

JUL 1 8 2005

PTO/SB/21 (02-04)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	10/820,111
Filing Date	April 8, 2004
First Named Inventor	Dennis Armand Proulx
Art Unit	2825
Examiner Name	Unknown
Total Number of Pages in This Submission: 3	Attorney Docket Number: ALC 3125

ENCLOSURES *(Check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment/Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Response to Missing Parts/ Incomplete Application
  - ☐ Response to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert to a Provisional Application
- ☑ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s) ______
- ☐ After Allowance communication to Technology Center (TC)
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
- ☐ Proprietary Information
- ☐ Status Letter
- ☐ Other Enclosure(s) (please identify below):

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Terry W. Kramer 41,541 KRAMER & AMADO, P.C.
Signature	Terry W. Kramer
Date	July 15, 2005

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below.

Typed or printed name			
Signature		Date	

PATENT

IN THE UNITED STATE PATENT AND TRADEMARK OFFICE

In re application of:	:	Dennis Armand Proulx et al.
For:	:	CENTRALIZED INTERNET PROTOCOL/MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT
Application No.	:	10/820,111
Filed	:	April 8, 2004
Art Unit	:	2825
Examiner	:	Unknown
Attorney Docket No.	:	ALC 3125
Confirmation No.	:	8431

CHANGE OF ADDRESS

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Dear Sir:

Applicant's attorneys have moved to the address listed below:

KRAMER & AMADO, P.C.
1725 Duke Street, Suite 240
Alexandria, Virginia 22314
Phone: (703) 519-9801
Fax: (703) 519-9802

Application No.: 10/820,111
Attorney Docket No.: ALC 3125

Please send all future correspondence concerning the above-identified application/registration to applicant's attorneys' new address.

Respectfully submitted,

July 15, 2005
Date

Terry W. Kramer
Terry W. Kramer
Reg. No. 41,541

KRAMER & AMADO, P.C.
1725 Duke Street, Suite 240
Alexandria, VA 22314
Tel. (703) 519-9801
Fax. (703) 519-9802

PATENT APPLICATION FEE DETERMINATION RECORD
Effective October 1, 2003

Application or Docket Number
10820111

CLAIMS AS FILED - PART I

	(Column 1)	(Column 2)
TOTAL CLAIMS	20	
FOR	NUMBER FILED	NUMBER EXTRA
TOTAL CHARGEABLE CLAIMS	20 minus 20=	* —
INDEPENDENT CLAIMS	3 minus 3 =	* —
MULTIPLE DEPENDENT CLAIM PRESENT	☐	

* If the difference in column 1 is less than zero, enter "0" in column 2

SMALL ENTITY TYPE ☐ OR OTHER THAN SMALL ENTITY

SMALL ENTITY RATE	FEE		OTHER THAN SMALL ENTITY RATE	FEE
BASIC FEE	385.00	OR	BASIC FEE	770.00
XS 9=		OR	XS18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL		OR	TOTAL	770

CLAIMS AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	* 20	Minus	** 20	=
Independent	* 3	Minus	*** 3	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				

SMALL ENTITY RATE	ADDITIONAL FEE		OTHER THAN SMALL ENTITY RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	0
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	0

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				

SMALL ENTITY RATE	ADDITIONAL FEE		OTHER THAN SMALL ENTITY RATE	ADDITIONAL FEE
X$ 9=		OR	X$18=	
X43=		OR	X86=	
+145=		OR	+290=	
TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

AMENDMENT C

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA
Total	*	Minus	**	=
Independent	*	Minus	***	=
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM ☐				

SMALL ENTITY RATE	ADDITIONAL FEE		OTHER THAN SMALL ENTITY RATE	ADDITIONAL FEE
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X43=		OR	X86=	
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TOTAL ADDIT. FEE		OR	TOTAL ADDIT. FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20."
***If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3."
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

K&A

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KRAMER | AMADO PC
PATENT RESEARCH SERVICES
INTELLECTUAL PROPERTY LAW

1725 DUKE STREET
SUITE 240
ALEXANDRIA, VIRGINIA 22314
PHONE: (703) 519-9801
FACSIMILE: (703) 519-9802
WWW.KRAMERIP.COM

Fax Memo

TO:	**Mail Stop Amendment** **USPTO**
FAX NO.:	**(571) 273-8300**
FROM:	**Terry W. Kramer** **KRAMER & AMADO, P.C.**
DATE:	**September 29, 2006**
SUBJECT:	**U.S. Patent Application** **Title: CENTRALIZED INTERNET PROTOCOL/MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT** **Serial No.: 10/820,111** **Attorney Docket No.: ALC 3125**
PAGES:	**INCLUDING COVER PAGE (4)**

Message: Submitted herewith are the following:

- Transmittal Form (1 page)
- Status Inquiry (2 pages)

In the event that the fees submitted herewith are insufficient, please charge any remaining balance, or credit any overpayment, to our Deposit Account Number 50-0578.

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PTO/SB/21 (09-04)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	10/820,111
Filing Date	April 8, 2004
First Named Inventor	Denis Armand Proulx
Art Unit	2825
Examiner Name	Unknown
Attorney Docket Number	ALC 3125
Total Number of Pages in This Submission	3

ENCLOSURES *(Check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment/Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Reply to Missing Parts/ Incomplete Application
  - ☐ Reply to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert to a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s) ______
  - ☐ Landscape Table on CD
- ☐ After Allowance Communication to TC
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
- ☐ Proprietary Information
- ☑ Status Letter
- ☐ Other Enclosure(s) (please Identify below):

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	Kramer & Amado, P.C.
Signature	Terry W. Kramer
Printed name	Terry W. Kramer
Date	October 2, 2006
Reg. No.	41,541

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:

Signature	Bridgett D. Franklin
Typed or printed name	Bridgett D. Franklin
Date	10/02/06

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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OCT 0 2 2006

PATENT

IN THE UNITED STATE PATENT AND TRADEMARK OFFICE

In re application of:	:	Denis Armand Proulx, et al.
For:	:	CENTRALIZED INTERNET PROTOCOL/MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT
Serial No.	:	10/820,111
Filed	:	April 8, 2004
Art Unit	:	2825
Examiner	:	Unknown
Attorney Docket No.	:	ALC 3125
Confirmation No.	:	8431

STATUS INQUIRY

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Dear Sir:

The above-identified patent application has been on file since April 8, 2004 and to date no substantive Action on the merits has been received. It is respectfully requested that an Action be issued, or an indication of when such Action may be issued.

Application No.: 10/820,111
Attorney Docket No.: ALC 3125

No fee is believed to be due for this submission. Should any fees be required, please charge our Deposit Account No. 50-0578 and/or please credit any excess fees to such Deposit Account.

Respectfully submitted,

Terry W. Kramer

DATE: September 29, 2006

Terry W. Kramer
Reg. No. 41,541

KRAMER & AMADO, P.C.
1725 Duke Street, Suite 240
Alexandria, Virginia 22314
Tel. (703) 519-9801
Fax. (703) 519-9802

IFW

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	10/820,111
Filing Date	April 8, 2004
First Named Inventor	Denis Armand Proulx, et al.
Art Unit	8431
Examiner Name	Unknown
Attorney Docket Number	ALC 3125
Total Number of Pages in This Submission	102

ENCLOSURES *(Check all that apply)*

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment/Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☑ Certified Copy of Priority Document(s)
- ☐ Reply to Missing Parts/ Incomplete Application
  - ☐ Reply to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert to a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
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- ☐ CD, Number of CD(s) ______
  - ☐ Landscape Table on CD
- ☐ After Allowance Communication to TC
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- ☐ Proprietary Information
- ☐ Status Letter
- ☐ Other Enclosure(s) (please Identify below):

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	Kramer & Amado, P.C.		
Signature	Terry W. Kramer		
Printed name	Terry W. Kramer		
Date	November 22, 2006	Reg. No.	41,541

CERTIFICATE OF TRANSMISSION/MAILING

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Signature			
Typed or printed name	Moira Anderson	Date	

PATENT

IN THE UNITED STATE PATENT AND TRADEMARK OFFICE

In re application of:	:	Denis Armand Proulx, et al.
For:	:	CENTRALIZED INTERNET PROTOCOL/MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT
Serial No.	:	10/820,111
Filed	:	April 8, 2004
Art Unit	:	2825
Examiner	:	Unknown
Attorney Docket No.	:	ALC 3125
Confirmation No.	:	8431

TRANSMITTAL OF CERTIFIED COPY OF PRIORITY DOCUMENT

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Dear Sir:

Applicants have claimed priority of Application No. 2,425,442 filed April 15, 2003 in Canada, under 35 U.S.C. § 119. In support of this claim, a certified copy of said application is submitted herewith.

Application No.: 10/820,111
Attorney Docket No.: ALC 3125

No fee is believed to be due for this submission. Should any fees be required, please charge our Deposit Account No. 50-0578 and/or please credit any excess fees to such Deposit Account.

Respectfully submitted,

Terry W. Kramer

DATE: November 22, 2006

Terry W. Kramer
Reg. No. 41,541

KRAMER & AMADO, P.C.
1725 Duke Street, Suite 240
Alexandria, Virginia 22314
Tel. (703) 519-9801
Fax. (703) 519-9802

Office de la propriété intellectuelle du Canada | Canadian Intellectual Property Office

Un organisme d'Industrie Canada | An Agency of Industry Canada

Bureau canadien des brevets | Canadian Patent Office

Certification | Certification

La présente atteste que les documents ci-joints, dont la liste figure ci-dessous, sont des copies authentiques des documents déposés au Bureau des brevets.

This is to certify that the documents attached hereto and identified below are true copies of the documents on file in the Patent Office.

Specification and Drawings, as originally filed, with Application for Patent Serial No: **2,425,442,** on April 15, 2003, by **ALCATEL CANADA INC.,** assignee of Denis A. Proulx, Craig Ellirt Timmerman, Felix Katz, Margaret Rachniowski, Afshan Zabihi and Macmohana S. Virdy, for "Connectivity Verification for Internet Protocol/Multi-Protocol Label Switching Data Communications Networks".

L. Régimbal

Agent certificateur/Certifying Officer

April 14, 2004

Date

Canada

(CIPO 68)
04-09-02

OPIC CIPO

Abstract

A framework for connectivity verification is provided. The framework includes a connectivity verification server performing unattended connectivity verification, and a connectivity verification application, both the connectivity verification server and connectivity verification application operating in a network management context. Connectivity verification jobs are defined via the connectivity verification application and the connectivity verification server is configured accordingly. Connectivity verification jobs can also be scheduled. The connectivity verification application also provides a display of connectivity verification results. The results of each connectivity verification job may be compared against a desired connectivity profile and deviations from the connectivity profile may be used to raise alarms. Connectivity verification results, including alarm information, are further used to generate a network map displaying selected connectivity verification results. The advantages are derived from using the framework to perform unattended scheduled connectivity verification at reduced operational costs.

Connectivity Verification for Internet Protocol / Multi-Protocol Label Switching Data Communications Networks

Field of the invention

[01] The invention relates to data network management, and in particular to methods and apparatus for centralized connectivity verification ensuring adherence to service level agreements.

Background of the invention

[02] In the field of Internet Protocol (IP) / MultiProtocol Label Switching (MPLS) data communications, it is known to verify whether two data network nodes can reach each other by employing functionality provided by a "ping" and a "traceroute" command. The implementation of the ping and traceroute command functionality specification is described in RFC-1147 which is incorporated herein by reference. A short summary of the relevant concepts of the ping and traceroute commands follows:

[03] Persons of ordinary skill in the art would understand that data communications networks conveying data packets in accordance with the IP protocol and the MPLS protocol do so in accordance with a store and forward discipline. At each data network node in a communications network, a packet is received via an input port, stored, an output port determined in real-time, and the packet is forwarded over the determined output port. Real-time port determination is known as routing functionality and is performed by a router network element. The real-time determination of the output port is made dependent on a variety of factors including: destination addressing information held in packet headers, forwarding class associativity, packet traffic

differentiation, operational states of inter-connecting links between network nodes, transport bandwidth availability, etc.

[04] Persons of ordinary skill in the art would understand that data communications networks conveying data packets in accordance with the IP protocol, do so in accordance with a best-effort packet transport discipline. The best-effort discipline does not guarantee that data packets will reach their destinations, does not guarantee bounded packet arrival latencies, does not guarantee bounded packet arrival jitter, etc. In fact packets specifying the same source network address and the same destination network address do not necessarily follow the same transport path in a data communications network, which is known in the art as loose source routing.

[05] The real-time output port determination described above may lead to situations in which packet transport loops are established. Each IP packet carries a Time-To-Live (TTL) specification in its header, which is an integer header field value which is set by a source data network node sending the packet (or a gateway at an edge between a customer network and a service provider network) and decremented at each data transport node forwarding the packet. When the TTL value reaches zero (0), the packet is discarded.

[06] Although simple, this approach puts a lot of pressure on IP network design to ensure that only a small number of data transport nodes, and therefore interconnecting links, are traversed between a source data network node and a destination data network node. The physical implementation of the interconnecting links is varied and may include additional data/packet transport protocols, therefore from the point of view of connectivity verification, the data communications network infrastructure between two data transport nodes is referred to as a "hop" to make an abstraction thereof.

[07] As mentioned herein above, the best-effort packet transport discipline does not guarantee bounded packet arrival latencies. Latency is the amount of time it takes for a packet to traverse a communications network from its source

data network node to its destination data network node. Latency is typically measured in milliseconds and includes physical data transport delays associated with physically conveyance of packets over physical interconnecting links, as well as packet processing delays incurred by packet while being stored at transport network nodes, in a transport path between the source network node and the destination network node, while pending determination of output ports.

[08] As mentioned herein above, the best-effort packet transport discipline does not guarantee bounded packet arrival jitter. Jitter is a measure of the variation of packet inter-arrival delays, and relates to a measure of the standard deviation of a group of delays incurred by a group of individual data packets typically associated with a data stream used in provisioning a data service.

[09] The provision of data services, which is beyond the present description, is dependent on the resultant Quality-of-Service provided. Quality-of-Service is a combination of bandwidth, arrival delay, and jitter specifications for a particular data service provisioned end-to-end over a given interconnecting communications network infrastructure.

[10] A person skilled in the art would understand that the MPLS transport protocol has been developed in order to provide high Quality-of-Service packet transport. Although, delays associated with physical propagation packets over physical interconnecting links can only be reduced to a certain extent, the MPLS technology provides: bandwidth reservation on the interconnecting links to ensure a resource availability, strict (pre-specified) routing / transport path to minimized packet processing delays along the path, and consolidated multi-transport layer switching minimizing switching delays at switching network nodes in the path. Packets having the same source network address and the same destination network address may follow different transport paths dependent on a Service Level Agreement (SLA) specification for each packet.

[11] It is the adherence to a service level agreement in an MPLS environment, and the need to adhere to a service level agreement specification in a best-effort IP environment that is being addressed in the present description.

[12] Implementation of ping and traceroute functionalities includes the return conveyance of at least one individual echo return Internet Control Message Protocol (ICMP) packet in a data communication network between a source network node and a destination network node to verify connectivity between remote computers.

[13] The extent to which connectivity is verified by ping packets, as they are known, relates to reachability, see Fig. 2. Ping packets carry a TTL value, and therefore reachability includes: an assessment as to whether there is at least a sequence of interconnecting links which when traversed a packet can be conveyed between the source network node and the destination network node, as well an assessment as to whether a bound sequence of interconnecting links exists. It is emphasized that each packet tests connectivity between a pair of pre-specified source network node and destination network node.

[14] Besides reachability, each ping packet is also stamped with a time value corresponding to the time at which the ping packet was sent from the source network node. Upon the return of the ping packet at the source network node, the aggregate return transport delay is calculated. In sending a group of ping packets, the corresponding group of aggregate return transport delays are used to determine: minimum delay, maximum delay, average delay (in milliseconds), and jitter. The determined minimum delay, maximum delay, average delay, and jitter is referred to as packet transport statistics.

[15] The extent to which traceroute packets verify connectivity, as they are known, relates network node discovery between a source to a destination network node, see Fig. 3. Implementing traceroute functionality employs groups of ICMP echo return packets bearing increasing TTL values, and directed to the destination network node. Traceroute packets are returned to

the source network node when the TTL value is decremented to zero, determining a transport network node incrementally further along between the source network node and the destination node.

[16] For a source routed Label Switched Path (LSP) pre-established path, physical network nodes incrementally further along the LSP transport path may not return traceroute packets as the traceroute packet is encapsulated while in transport through the LSP with the TTL value only being decremented at the distal end of the LSP which does return a traceroute package, see Fig. 4. Traceroute packets are returned by network nodes beyond the distal end of the LSP.

[17] In a best-effort IP environment, it cannot be guaranteed that all traceroute packets are routed the same as packet processing conditions change dynamically at network nodes between the source and the destination network nodes. A degree of stability in a communications network is expected, although not guaranteed, which when traceroute packet are sent in a relatively rapid succession, results in the group of traceroute packets following substantially the same transport path.

[18] A returned traceroute packet is used to extract transport delay information. Statistical information is derived from successive sequences of traceroute packets. Therefore transport delay and jitter profiles can be provided for each transport path between a pair of network nodes in a data communications network. The extent to which these delay and jitter profiles can be used to derive per-hop statistics is left to higher level applications interpreting the statistical information which are beyond the scope of the present description.

[19] Having provided an overview of ping and traceroute functionality, it is important to emphasize that, ping and traceroute packets are sent from a source network node and returned to the same source network node. The resulting statistics are also made available by and at the source network node.

[20] Service providers include organizations and data communications network infrastructure providing data transport services to customers. Services include best-effort data transport, MPLS data transport, as well as differentiated services such as Virtual Local Area Networking (VLAN) in support of Virtual Private Network (VPN) connectivity.

[21] Currently service providers make extensive use of ping and traceroute functionality to verify connectivity on a very limited basis. Typically an operator needs to physically and manually log-in on each remote source network node to access a Command Line Interface (CLI), issue necessary ping and/or traceroute commands from a prompt specifying network node addressing manually, capture the output of the console, and retrieve the output from the remote source network node.

[22] In service provider communications network it is more important to verify connectivity between individual routers. Referring to Fig. 1, five fully meshed routers R1, R2, R3, R4 and R5 providing VPN services VPN1 and VPN2 are shown. Connectivity verification between Location 1 and Location 3 can be performed manually in two steps: ping/traceroute test T1 is run from R1 towards R3 and a second ping/traceroute test T2 is run from R3 towards R1. Each time a ping/traceroute test is run, the operator has to log-in on the source router, run the ping/traceroute test, and retrieve the results.

[23] If connectivity verification is required between all peer routers in VPN1 more test steps would be required, for example ping/traceroute test T3 verifies connectivity from Location 2 to Location 3, and another ping/traceroute test would be necessary to verify connectivity to Location 3 from Location 2. Also, another two ping/traceroute tests would have to be done between Location 1 and Location 2.

[24] The operator has to perform more ping/traceroute tests for the other VPNs, for example VPN2 between Location 2 and Location 4.

[25] The connectivity verification has to be done in two separate steps between each pair of locations, and it is not obvious to the operator which router IP address and VLAN IDentifier (VPN1/VPN2) to use from which router. This level of operator involvement is inadequate as command entry is a very time consuming, complex, and error prone procedure leading to large operational overheads incurred by service providers. In particular, manual command entry makes it impossible for connectivity verification to be performed in an environment in which a large number of customers are serviced by a service provider using an infrastructure of a large number of communications network nodes interconnected via a large number of links. Meaningful statistics need be derived from a large number of ping/traceroute tests.

[26] Persons of skill in the art understand that packet traffic patterns vary over a period of time and are typically cyclical over the time of a day and cyclical over a week. It is important to both customers and service providers that connectivity verification be performed during peak hours (business hours and evenings) and peek weekdays (workdays and weekends). Therefore it is apparent that if manually directed connectivity verification is time consuming, then manual connectivity verification within a test window would be impossible due to overwhelming operational overheads involved. The number of connectivity verification tests grows with the number of location combinations for each VPNs making connectivity verification even more complex and time consuming.

[27] The closest prior art relates to network topology discovery and includes:

[28] A prior art United States Patent 6,502,130 B1 entitled "System and Method for Collecting Connectivity Data of an Area Network" which issued on December 31st, 2002 to Keeler, Jr. et al. describes a system and method which collects dynamic connectivity data from an area network interconnecting multiple computing devices. The dynamic connectivity information is combine

in a data warehouse with static network information, relating to the various users and their privileges. The combined data stored in a data warehouse permits the identification of each user and the various privileges of the user, correlated to its connection port. The productivity data is collected using commands in the simple network management protocol (SNMP). SNMP commands query all network devices such as hubs, routers, and gateways to other networks to obtain port connectivity information such as the identity of the ports being used by each network user. Although inventive, the solution proposed by Keeler Jr. et al. only achieves Open Systems Interconnect (OSI) Layer 2 and 1 connectivity discovery in support of billing applications for users subscribing to roaming network access services. Keeler Jr. et al. do not address issues related to ensuring adherence to service level agreements in real-time.

[29] A prior art United States Patent 6,205,122 B1 entitled "Automatic Network Topology Analysis" which issued on March 20th, 2001 to Sharon et al. describes a system and method for automatic detection of physical network topology, by correlating information from computers connected to a network. Although inventive, the solution presented by Sharon et al. does not address issues related to ensuring adherence to service level agreements in real-time.

[30] A prior art United States Patent 6,397,248 B1 entitled "System and Method to Discover End Node Physical Connectivity to Networking Devices" which issued on May 28th, 2002 to Iyer describes an apparatus and method for determining physical connectivity between end nodes and networking devices within a network. Iyer addresses issues related to the SNMP protocol's inability to ascertain the physical connection between end nodes and networking devices. Although inventive, the solution presented by Iyer does not address issues related to ensuring adherence to service level agreements in real-time.

[31] A prior art United States Patent 6,405,248 B1 entitled "Method and Apparatus for Determining Accurate Topology Features of a Network" which issued on June 11th, 2002 to Wood describes a method for determining accurate

topology features of a given network utilizing source address tables. The solution proposes acquiring source address table information from each port of each network switching node at regular intervals to determine when a particular source address was learned and when discarded. The source address information is used to issue Address Resolution Protocol (ARP) queries to ensure that the source address information is valid. While inventive, the solution presented by Wood does not address issues related to ensuring adherence to service level agreements in real-time.

[32] A prior art United States Patent 5,974,237 entitled "Communications Network Monitoring" which issued on October 26th, 1999 to Shurumer et al. describes a proprietary method for monitoring a communications network comprising a plurality of node equipment such as switches, and link equipment such as fiber optic links in which proprietary performance parameters of individual vendor specific components of the node equipment are used to determine an overall proprietary performance parameter for the node equipment. By comparing like proprietary performance parameters for individual network elements, the performance of different types of proprietary network elements can be compared with each other. Parameters which can be monitored include quality of service, cell discard, cell loss, and other measures of network performance. Connection tracing through the plurality of node equipment and link equipment is used employing proprietary means to provide topology discovery. While inventive, the solution presented by Shurumer et al. does not address issues related to ensuring adherence to service level agreements in real-time.

[33] Other developments include, a prior art United States Patent 6,222,827 B1 entitled "Telecommunications Network Management System" which issued on April 24th, 2001 to Grant et al. describes a system for managing a Synchronous Digital Hierarchy (SDH) network and proposes the tracking and processing of network related data in support of specifying connectivity parameters for establishing data pipes. The solution relates to a network management system

which forms an overall view of the network and its condition from which the system gives configuration commands to each transmission equipment so that all configuration changes can be performed significantly more rapidly. While inventive, the solution presented by Grant et al. does not address issues related to ensuring adherence to service level agreements in real-time.

[34] Reducing operating expenditures is important service providers. Addressing these concerns is especially important in large and complex Service Provider IP/MPLS networks. There therefore is a need to solve the above mentioned issues.

Summary of the invention

[35] In accordance with an aspect of the invention, a framework for connectivity verification is provided. The framework includes a connectivity verification server performing unattended connectivity verification, and a connectivity verification application, both the connectivity verification server and connectivity verification application operating in a network management context.

[36] In accordance with another aspect of the invention, connectivity verification jobs are defined via the connectivity verification application and the connectivity verification server is configured accordingly.

[37] In accordance with a further aspect of the invention, connectivity verification jobs are scheduled and the connectivity verification server performs scheduled connectivity verification.

[38] In accordance with a further aspect of the invention, the connectivity verification application also provides a display of connectivity verification results.

[39] In accordance with a further aspect of the invention, the results of each connectivity verification job may be compared against a desired connectivity profile and deviations from the connectivity profile may be used to raise alarms.

[40] In accordance with yet another aspect of the invention, connectivity verification results, including alarm information, are further used to generate a network map displaying selected connectivity verification results.

[41] The advantages are derived from using the framework to perform unattended scheduled connectivity verification at reduced operational costs.

Brief description of the drawings

[42] The features and advantages of the invention will become more apparent from the following detailed description of the preferred embodiment(s) with reference to the attached diagrams wherein:

FIG. 1 is a schematic diagram showing prior art manual connectivity verification;

FIG. 2 is a schematic diagram showing a ping connectivity verification test being performed between a source and destination node;

FIG. 3 is a schematic diagram showing a traceroute connectivity verification test being performed between a source and destination node;

FIG. 4 is a schematic diagram showing a traceroute connectivity verification test being performed between a source and a destination node via an LSP;

FIG. 5 is a schematic diagram showing elements of a connectivity verification framework in accordance with an exemplary embodiment of the invention;

FIG. 6 is a schematic diagram showing network nodes participating in a VPN and a fully meshed bi-directional group of connectivity validation tests to be performed in accordance with the exemplary embodiment of the invention; and

FIG. 7 is a schematic diagram showing connectivity verification performed in accordance with the exemplary embodiment of the invention.

[43] It will be noted that in the attached diagrams like features bear similar labels.

Detailed description of the embodiments

[44] Fig. 5 shows a framework in accordance with an exemplary embodiment of the invention. A connectivity verification application makes use of an IP map application and/or a Layer 2 map application to select source and destination network nodes from a selection of network node tracked via a containment hierarchy by a network management server.

[45] The selected source and destination network nodes are used to define a connectivity verification job. A schedule may be defined for the connectivity verification job. The definition of the connectivity verification job includes specifying connectivity verification parameters including the number of connectivity verification tests to be performed and thresholds to be applied to connectivity verification results returned.

[46] In accordance with another implementation of the exemplary embodiment of the invention, by specifying a source and destination network node pair, a pair of bi-directional connectivity verification tests is defined.

[47] In accordance with another implementation of the exemplary embodiment of the invention, IP and Layer 3 objects having a source and destination network node may be selected from the containment hierarchy.

Such objects include IP links, LSPs, etc. VPNs may specify a large group of participating network nodes. In accordance with another implementation of the exemplary embodiment of the invention, by specifying a group of network nodes fully meshed bi-directional connectivity verification tests will be performed between the group of network nodes. See Fig. 6 for a selected group of five network nodes and the bi-directional connectivity verification tests to be performed therebetween although fully meshed interconnecting links may not exist therebetween.

[48] Each connectivity verification job can be dispatched for immediate execution via a connectivity verification server or stored with the connectivity verification server for delayed and/or repeated execution.

[49] The connectivity verification server queues connectivity jobs with a Command Line Interface Processor (CLIP) at the appropriate time specified by the scheduling information (or immediately upon request). The CLIP processor takes over the issuing of commands to source destination nodes and the retrieval of connectivity verification results in an interaction session in which the CLIP processor logs-on the source network node. The CLIP processor sequences command issuance so as not to over burden the communications network with ICMP traffic.

[50] Connectivity verification results are provided to the connectivity server which compares the connectivity verification results against thresholds specified for the connectivity verification job to ensure adherence to SLA agreements. When thresholds are reached alarms are raised with an alarm server. The alarm information may also be propagated to the connectivity verification application. The alarm information provided to the connectivity verification application may be subsequently updated by the alarm server.

[51] In accordance with another implementation of the exemplary embodiment of the invention, each connectivity verification result is compared

against a threshold profile comprising at least two thresholds, multiple thresholds being used to implement multiple levels of alarm severity.

[52] Connectivity verification results are also provided to the connectivity verification application. The connectivity verification application uses the connectivity verification results and alarm information to highlight Layer 2 and Layer 3 objects affected by the alarm information. The connectivity verification information may be interacted with to cause the display of Layer 2 and Layer 3 objects associated with a particular connectivity verification test and/or connectivity verification job.

[53] In accordance with the exemplary embodiment of the invention, the problem of verifying IP connectivity in a service provider IP/MPLS network using an NMS system is addressed by:

- Performing directed Ping and Trace Route connectivity test using source and destination objects.
- Performing connectivity test using Routers and IP Interfaces.
- Performing connectivity test using MPLS LSP.
- Performing connectivity test within IPVPN. (VRF – VLAN ID) See RFC 2547 L3VPN incorporated herein by reference.
- Performing connectivity to unmanaged routers (IP address discovered)
- Scheduling the 'N' connectivity test to verify connectivity periodically.
- Scheduling the 'N' connectivity test to summarize statistics for the IP traffic characteristics (Delay, Jitter, loss) of packets.
- Ability to configure alarm threshold on the 'N' connectivity test schedule results to ensure service level agreements (SLA) are met.
- Highlighting the single or many routes of the packet that failed or succeeded on the NMS IP MAP

[54] According to the present invention, the NMS provides a network view of the IP objects including Routers, IP links, IP interfaces, IP address of

Unmanaged Routers, LSP and VPN, making the connectivity verification test easier to create.

[55] The operator is provided with means to collect the statistics from 'N' connectivity verification tests.

[56] The operator can easily run a connectivity verification test via a single click to verify VPN connectivity.

[57] A mechanism is provided to schedule 'N' connectivity verification tests and to collect the results in a central location for analyzing the data.

[58] Immediate alarms generated from the results of 'N' connectivity verification tests in view of thresholds are provided.

[59] Referring to Fig. 7, according to a use scenario of the exemplary embodiment of the present invention, the NMS operator can easily create one schedule to test the VPN connectivity shown.

[60] In the example only two VPN exist. The operator creates one schedule and identifies the connectivity verification tests (T1,T2,T3,T4,T5,T6,T7,T8).

[61] The NMS operator with a single click initiates the connectivity verification tests.

[62] The NMS operator can specify that the connectivity verification test be executed periodically.

[63] The NMS operator can set thresholds for expected connectivity verification results to trigger alarms when IP packets flow requirements are not met to ensure adherence to SLA agreements.

[64] The NMS CLIP processor sends Ping and Trace Route commands (operations) to the routers. The connectivity verification tests can specify one or more of the following NMS objects as the source for the operation:

- Router (Router managed by the NMS),
- First Hop LSP (determines the Router), and
- VPN (VRF name).

The NMS destination objects include:

- Any IP address (NMS managed Router and Unmanaged Router),
- Router,
- Router Interface (Numbered and Unnumbered (Router ID - string)), and
- LSP (the destination router will be determined by the destination endpoint of the LSP).

[65] The operator can configure specific connectivity verification parameters for the connectivity verification test such as the number of pings to execute, packet size, data fill patterns, time to wait for response, type of service.

[66] The operator can set threshold on the packet statistics for X number of connectivity failures, round trip delay, jitter, packet drop requirements.

[67] The NMS is then able to perform one of the following tasks for the entries specified:

1. Ping operation from the source to the destination (results and statistics displayed to the operator).
2. Traceroute operation from the source to the destination (results and statistics displayed to the operator).
3. Highlight the results of the traceroute operation. This will highlight layer 2 and layer 3 objects on the NMS Layer 2 and IP maps.
4. Save the results as text or CSV format to a local file to be analyzed later.
5. Historical results from all operations are available in a result log on the connectivity verification server.
6. Highlight objects based on what is selected in the operation list or the result list.
7. Export and/or import the Operation List.

8. For the scheduled connectivity verification test, summarize the packet statistics for historical review.
9. For the scheduled connectivity verification test, generate alarms when the thresholds are met/exceeded.

[68] The following is a more detailed description of features of the invention as exemplarly implemented in an exemplary connectivity verification application in accordance with the exemplary embodiment of the invention. Heretofore the connectivity verification application and the subject matter of the invention is referred to as an "IP Maintenance and Diagnostics" solution. Any limitations mentioned in the following description relate to the particular implementation described and should not be interpreted as limiting the invention described herein in any way.

GLOSSARY

CLI	*Command Line Interface.* This is a command driven text based user interface to a device.
CORBA	*Common Object Request Broker Architecture.* An architecture that enables communication between program objects regardless of the programming language the objects are written in or the operating system they run on.
CSV	*Comma Separated Value.* A way of recording values in text format with each value followed by a comma.
VPN	*Virtual Private Network.*
VRF	*VPN Routing and Forwarding.*

INTRODUCTION

This Feature Specification outlines expected IP Maintenance and Diagnostics functionality. It allows users of the Alcatel NMS Network Manager to gather information about the IP connectivity in the network for maintenance and diagnostics purposes.

Terminology

Frequency – The time between each iteration of a schedule.

VPN – This document, unless otherwise specified, deals with routed IP VPNs. As such, the term indicates a set of IP-enabled systems and networks that communicate over a shared infrastructure with comparable access and security practices to a private network.

Iteration – One run of a schedule (i.e. one summary period).

Schedule - A schedule is a list of ping operations that will be executed at a specific time.

FUNCTIONAL OVERVIEW

Summary of Functionality

The IP Maintenance and Diagnostics provides the following main functions:

Fn1: Performing Ping Operations.

Fn2: Performing Traceroute Operations.

Fn4: Queuing Ping and Traceroute Operations.

Fn5: Determine statistics from each Operation (such as jitter).

Fn6: Viewing the results of Ping and Traceroute Operations.

Fn7: Saving results from Operations to a user defined file in different formats.

Fn8: Highlight affected objects from a Ping or Traceroute.

Fn9: Saving and Opening Operations Lists.

Fn10: Scheduled Ping Operations

Fn11: Configurable Threshold Values

Fn12: Create an alarm when a threshold is exceeded for a Schedule

Fn13: Summarized statistics

IP Maintenance and Diagnostics will also support the following key functionality:

NFn1: Scheduled Traceroute Operations.

NFn2: Configurable Traceroute and Ping ICMP parameters.

NFn3: Ping and Traceroute from source NMS

NFn4: Partitioned Nodes as Ping and Traceroute source objects

NFn5: SNMP support for MIB 2925

Typical Application

IP Maintenance and Diagnostics allows users access to information that will help them with maintenance and diagnostic issues associated to their IP network.

i. Ping and Traceroute

Ping and Traceroute commands are executed on a router so information can be displayed to the user. It gives users the ability to perform traceroute and ping operations to determine connectivity information such as delay, packet loss, jitter and routes.

The IP Maintenance and Diagnostic system consists of a client user interface and a server process. The server process controls the connection to the router and the ping, traceroute and scheduling operations (see Figure 0-1). It is running on the active Alcatel NMS and will be active on the standby if a switchover occurs.

Each IP Maintenance and Diagnostic client connects to the server process on the active NMS to send ping and traceroute operations to the routers. The client can specify one or more of the following objects as the source for the operation:

- Router Management IP Address (Router supported by the 5620)
- Node (with an IP Address)
- Router Interface
- First Hop LSP (the source router will be determined by the source endpoint of the LSP)
- VRF name (with a supported router specified).

The client can specify one of the following as the ping destination:

- Any IP address (whether it is a NMS managed object or not).
- Router ID (Router managed by the 5620)
- Node (by specifying its IP Address)

Pasting in one of the following objects known to the NMS can also specify a destination:

- Router Interface (the destination endpoint will be the router interface IP address, in the case of unnumbered, it is the router ID)
- LSP (the destination router will be determined by the destination endpoint of the LSP)

The client is then able to perform one of the following tasks for that entry (see Figure 0-1):

10. Ping from the source to the destination (results and statistics displayed to the user).
11. Traceroute from the source to the destination (results and statistics displayed to the user).
12. Save the results as text or CSV format to a local file.
13. Historical results from all operations are available in a result log on the server.
14. Highlight objects based on what is selected in the operation list or the result list.
15. Save and/or retrieve the Operation List.

Ping and traceroute operations are very easy to initiate. There can be multiple operations at one time, but to protect against performance issues, only one operation is allowed at any time to one source router. The application has the ability to queue multiple operations that are initiated so the user does not have to wait for one operation to complete before initiating the next. The only visible effect the user will see is that the operation may take a bit longer to complete.

The results from each individual ping and traceroute can be viewed. The information includes statistics such as jitter, percent of packets lost, and delay. After the user has configured ping and traceroute operations, they have the ability to save that list for future use (no operation results are saved). To use a previously saved operation list, they must open the file containing the operations. No validation occurs when a list is retrieved into the application and the last results for those newly retrieved operations are not available.

ii. Scheduled Operations

Scheduled ping operations perform similar to user-initiated operations and have the same limitations.

The Scheduled operations have the added functionality that allows them to store results every time the operations run, and to create summary statistics. It gives the customer the ability to check connectivity between endpoints at specific times and/or specific Iterations. This can help determine if SLA's are being met for customers VPN and/or if there is a failure in the network (see Figure 0-2). An example implementation of a schedule for Customer A VPN1 in Figure 0-2 can be seen in Figure 0-8. The user can customize thresholds to raise alarms if any of the summary statistics do not meet defined SLA values.

The functionality defined in section i applies to scheduling, except that the server performs the initiation of the operation at a set time and frequency rather than the user initiating the operation. The Server initiates the operations based on the scheduling information contained for each schedule. If a schedule is running, and a user tries to invoke an operation to the same router, they will be warned and the operation will be queued until the schedule has finished with the specified source router. If a user is currently performing an operation on a router and a schedule runs with the same source defined, the user operation is cancelled and the user is notified. The schedule has priority at all times. All parameters defined for a schedule applies to all the contained operations in that schedule.

The individual results and summary statistics from the operations can be viewed at any time. The summary information includes statistics such as jitter, percent of packets lost, and delay. The individual results show exact error codes, such as node unreachable, and delay values that were used in the calculation of the summary statistics. The results can then be saved to a file for further analysis. The summary statistics, which are calculated based on the individual results per operation, can then be used to raise alarms to the fault management system. The summary results are based on the user specified summary period, which is a number of individual results contained in a summary period.

The user can specify thresholds for each schedule. These thresholds apply to all operations contained in that schedule. If a threshold is exceeded, based on the

summary statistics, an alarm will be generated to the fault management system with the user-specified severity.

FUNCTIONAL DETAILS

Overview

IP Maintenance and Diagnostics consists of 2 clients, a main Operation Window and a Scheduling Window. Both are launched through the NMS main menu, and are not context sensitive (i.e. a router does not have to be selected for the menu to be enabled).

The operation window contains 2 types of operations, ping and traceroute. The ping and traceroute operation each allows parameters to be specified for each individual operation. After an operation has been configured, it is then added to an operation list. It does not automatically start the ping or traceroute operation, it must be initiated by selecting the operation, right clicking, and selecting "initiate" from the popup menu. The operation can be cancelled or deleted by the same popup menu. The operation list can then be saved to a user defined local file. The list can then be retrieved at a later time to allow the user to reuse operations.

After an operation completes, the user selects the completed operation and the results will then appear in the result list. This information includes the delay for each individual ping issued in a ping operation, jitter, maximum delay, average delay, minimum delay, errors, etc. The information in the result list can then be saved to a local file in one of two formats, text or CSV. Historical results are located on the server and contain the results from every ping and traceroute operation that has taken place.

The scheduling window contains ping operations that can be run at a specific time. The operations contained in a schedule run starting at the specified start time, at every frequency (e.g. if the frequency is 10 minutes, all operations in the schedule run every 10 minutes) until it reaches the end time. The user can create an operation directly in a schedule, retrieve operations from a file or they can copy and paste/drag and drop it from another schedule or the operation window. All ping operations contained in a schedule have the same parameters except for the destination and source fields.

The results include individual ping results and summary statistics. The summary statistics are the same as those for a regular ping operation except they are calculated over a summary period (e.g. for every 10 iterations calculate the statistics). For each summary period, the user can view the individual ping values and the time that they were returned from the router. The summary results and individual ping results can be saved to a file in one of two formats, text or CSV.

A schedule can also contain threshold values for Jitter, Delay and Packet Loss. If any of these threshold values are exceeded, an alarm can be generated to the fault management system. The schedule uses the summary statistics from each operation to determine if a threshold has been exceeded. It will then generate an alarm to the fault management system with the user-specified severity. The user will also be able to see in the scheduling window any operations that had an alarm or error generated for that summary period.

IP Maintenance and Diagnostics Operation Window

The IP Maintenance and Diagnostics Operation window contains 3 areas, Operation List section, Results section and the Response Pane. The operation list section contains all the pings and/or traceroutes that have already been created or queued and can be initiated. This allows the user to perform multiple operations at one time. To view the results of an operation, it must be complete, and then selecting it from the operation list will update the result section with the operations results. If the selected operation is in progress, the result window will automatically update when it receives the results.

The result section contains the information from that ping or traceroute including the delay, result and size from each individual ping or traceroute (hop) in the operation. The Response Pane includes statistics on the entire ping operation, such as jitter and packet loss percentage, and it will also be the area that displays any errors that occurred in the operation. In the case of a traceroute operation, the statistics are based on the selected hop in the result list. The Operation List and Result List have scrollbars that appear when the list

grows larger than their viewable area. A splitter window that separates the lists also allows the user to choose how large the viewable area is for each.
The Operation window contains common functionality that is used in the Scheduling window.

iii. Launching IP Maintenance and Diagnostics

Selecting "Administration->IP Diagnostics" from the NMS main menu opens the IP Maintenance and Diagnostics client. Restriction of this command is only done through scope of command for the main menu; there are no other restrictions to opening the window. It can be displayed at any time, a router or node does not have to be selected. If a valid router or node is selected when the window opens, it will by default be the specified source object with the name and IP address already filled in for the source field for an operation dialog. If it is an invalid object, the source fields will be blank and the user will have to specify a valid router or node. The user is allowed to open only one operation window at a time. If the user selects the IP Diagnostics menu a second time, and the window is already launched, it will bring it to the front for the user. The IP Maintenance and Diagnostics scheduling window can also open the operation window with the "File->Operation Window" menu item.

iv. Menus and Toolbars

Icon	Menu Item	Description
	Operation->New->Traceroute	Open the Traceroute window for creation.
	Operation->Initiate	Initiate the selected operation(s).
	Operation->Cancel	Cancel the selected operation(s).
None	Result->List LSP	List the LSPs between the selected source and destination in the Result List.
	File->Schedule Window	Open the Schedule window

Table 0-1: Menu items and associated Toolbar Icons

Common menu items and toolbars are found in Section xxv. The menu items identified in Table 0-1, are specific to the IP Maintenance and Diagnostics Operation window.

v. Saving the Result List to a Local File

Operation results can be saved to a local file in one of two formats, CSV or TXT. See section xxvii for a description of the save dialog.

Text Format

Ping Toronto - Ottawa

Source138.120.15.90: vrf - VPN1 Destination 13.13.13.2

Seq	Source	Destination	Delay (ms)
1	138.120.15.90	13.13.13.2	112
2	138.120.15.90	13.13.13.2	Node Unreachable
3	138.120.15.90	13.13.13.2	98

%Loss: 0.0 Jitter (ms): 0.0 min/max/avg (ms): 1.0/1.0/1.0

Traceroute Toronto - Ottawa

Source138.120.15.90: vrf - VPN1 Destination 56.56.56.56

Seq	Destination	Delay (ms)
1	12.12.12.1	10,Node Unreachable,5
2	13.13.13.2	4,6,6

Figure 0-1: Text Format Example (Ping and Traceroute)

When the user selects the text format for saving results ("Save as Type" field), it will save it in a standard space formatted file. The text file will also contain the statistics associated with the operation(s) appended to the end of the file (see Figure 0-1).

CSV Format

Ping, Toronto - Ottawa

Source,138.120.15.90: vrf - VPN1,Destination,13.13.13.2

Seq, Source, Destination, Delay (ms)

1, 138.120.15.90, 13.13.13.2,112

2, 138.120.15.90, 13.13.13.2,Node Unreachable

3, 138.120.15.90, 13.13.13.2,98

%Loss (ms),0.0

Jitter (ms),0.0

Min (ms),1.0

Max (ms),1.0

Avg (ms),1.0

Traceroute, Toronto - Ottawa

Source,138.120.15.90: vrf - VPN1,Destination, 13.13.13.2

Seq, Destination, Delay (ms)

1,12.12.12.1,10,Node Unreachable,5

2,13.13.13.2,4,6,6

Figure 0-2: CSV Format Example (Ping and Traceroute)

When the user selects the CSV format for saving results ("Save as Type" field), it will save it in a comma separated formatted file. The text file will also contain the statistics associated with the operation(s) appended to the end of the file (see Figure 0-2).

vi. Operation List

Column	Description
Type	The type of operation, Ping or Traceroute (see Table 0-3).
Name	The Name associated to the operation
Source	The router the operation is being performed on
Destination	The object the operation is being performed to
Timeout (ms)	The timeout to wait for a response from the destination.
Quantity	The number of individual pings in this operation
Interval (sec)	The interval between sending each ICMP packet.
Status	The status of the operation (see Table 0-5 for a list of status values).

Table 0-2: Parameters displayed in the operation list for each operation

The operation list contains the ping and traceroute operations specified by the user. The operations appear in the order they are added.

Icon	Description
	Ping Operation
	Traceroute Operation

Table 0-3: Icon representation of the "Type" field in the Operation List

The list will contain all the defined ping and traceroute operations created by the user and they are distinguishable by the "Type" column (see Table 0-3). IP Maintenance and Diagnostics does not allow concurrent operations to the same router. If multiple operations are queued for the same router, the status of the waiting operation(s) will be "In Progress" while the currently running/queued operations complete. If the user attempts to close the application with operations still "In Progress", a warning will appear to the user. If the user chooses to continue with the close of the application, the operations will be cancelled to the server before closing.

Item	Description
Initiate	Initiate the operation(s) on the node. This menu option is only enabled if an operation is currently not in progress
Cancel	Cancel the operation(s) once it has been initiated. This menu is only enabled if an operation is currently in progress
Delete	Delete the operation(s) from the list
Save Operations	Save the operation list for future use
Highlight	Highlight all known objects associated with the operation (see section xxxi)

Table 0-4: Menu items for the operation list popup menu

Double clicking on an operation in the operation list will open the appropriate operation window to allow the user to change any options for that operation. The user can control one or more operations by selecting them (highlighting one

or more operations) and right clicking (see Figure 0-3). This will produce a popup menu containing the control information for the selected operations (see Table 0-4).

Operation State in the Operation List

Depending on the state of the operation in the operation list, only certain actions are available (see Figure 0-4). The "Initial" state of the operation only occurs when the operation is first added to the operation list (or retrieved from a file). The operation will never go back to the "Initial" State. Once initiated, the operation will stay in the "In Progress" state until one of two things happens, the user cancels the operation, or the operation completes. When the operation enters the "Completed" or "Cancelled" state, the user can re-initiate the operation or delete it from the queue.

Icon	Description
✔	Completed – Results are available for the operation.
⧗	In Progress – The operation is running, no results are available yet.
-	Initial – The operation has never been run before (i.e. just add to the operation list).
⬣	Cancelled - The operation has been cancelled, the results are unavailable.
◆	Error - An error has occurred with the operation
●	Communication Error - A communication error to the server has occurred, the operation has been cancelled.

Table 0-5: Status values for each Operation in the Operation List

Icons in the operation list represent the operation status values, see Table 0-5 for a list of the status icons and their description. The results for an operation are only available when the operation is in the "Completed" state. If an operation is selected and its state is not "Completed", the results will be blank. The

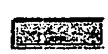
"Communication Error" state acts exactly as the "Cancelled" state, but can only be set by the application, and only during a server failure.

vii. Result List

Column	Description
IP Address / Hop	The IP Address of the destination of a ping, or the IP Address of a Hop for a traceroute operation.
Sequence	The sequence number of the individual ping or hop in the selected operation
Delay (ms)	The delay of the response from the destination, in milliseconds
Details 	This button in the details column, will display the Ping List dialog window with the associated traceroute results for that entry displayed in it. It does not appear for ping results.

Table 0-6: Parameters displayed in the result list for each operation

The result list contains the results from each individual ping or hop in each operation. Depending on what type of operation is selected, the list can contain the list of pings in a selected ping operation (see Figure 0-18), or the list of hops in the selected traceroute operation (see Table 0-6). The title for the IP Address column will change if the operation is a traceroute operation, this column becomes "Hop" (see Figure 0-20). If multiple operations are selected, the result list contains the entries from the first selected operation only. The results appear in order based on the sequence number of each individual ping or hop. If an operation error (i.e. valid diagnostics errors such as Network Unreachable or Node Unreachable for one of the responses) occurs for a Ping operation, the Delay column for that individual entry will display the error.

With a traceroute operation, the number of probes per hop is currently 3. The list of all the delays to that hop can be viewed in a separate window (see Figure 0-5). To display this list window, the user can press the  button (in the

"Detail" column) contained in the row that has more than one delay value (see Figure 0-3).. If an operation error (i.e. valid diagnostics errors such as Network Unreachable or Node Unreachable for one of the responses) occurs for a traceroute operation, the Delay column for that individual entry will display the letter "F" for each packet in the entry. When the user expands the results (i.e. opens the Ping List Window) the actual error will be displayed for each entry in the Delay column. There is a direct relationship between each "F" (failure) and the corresponding entry in the Ping List Window.

Item	Description
Highlight	Highlight selected source and destination objects only (see section xxxi).
Save Results	Save the results to a user specified file.
List LSP	List all known LSPs between the source and destination.

Table 0-7: Menu items for the result list popup menu

The user can perform actions on each result by selecting it in the result list and right clicking. This will produce a popup menu containing the control information for the selected results (see Table 0-7).

There is no way for IP Maintenance and Diagnostics to highlight the LSP(s) a traceroute or ping operation may go through. Instead, the user can select a specific result entry and execute "List LSP". This will open the List window containing all the known LSPs between the ping source and destination or the selected hop and previous hop for a traceroute operation. This menu item is never disabled, if there are no LSPs between a selected source and destination then the window will appear with no entries.

viii. Response Pane

Statistic	Description
Packet Loss (%)	The percentage of packets sent, that never reached the destination.
Jitter (ms)	Variance in delay in individual packets sent to the destination.
Maximum Delay (ms)	The slowest response time from the destination.

Minimum Delay (ms)	The quickest response time from the destination.
Average Delay (ms)	The average response time from the destination.

Table 0-8: Statistics displayed for each operation if successful

The response pane contains information about each ping and each hop in a traceroute operation (see Figure 0-6). If the operation is successful, it will display the statistics for the operation (see Table 0-8). If the operation is a traceroute operation, the user must select a specific hop to get the statistics for that hop.

If an execution error has occurred in the operation, the response pane will show the error message (see Figure 0-7) returned from the node and the result list will be empty. An execution error occurs not with an ICMP packet, but an error in the CLI command, such as invalid VRF name. If the results are saved to a local file, the statistics are appended to the end of the file. All operations are logged to a central server file; it includes each packet, the statistics and any errors (see section xxxiv).

IP Maintenance and Diagnostics Scheduling Window

The IP Maintenance and Diagnostics Scheduling window is very similar to the Operation window. It contains 4 areas, Schedule List section, Operation List section, Results section and the Response Pane. The schedule section contains all the schedules in the system. The operation list section contains all the pings available in the selected schedule from the schedule list. To view the summary statistics of an operation from a schedule, the operation must be selected in the operation list.

The result section contains the summary statistics information from the selected operation in the operation list. These statistics include jitter, average delay, and packet loss percentage. The Response pane at the bottom of the window contains any errors associated to the operation (i.e. configuration errors). The Schedule list, Operation List and Result List have scrollbars that appear when the list grows larger than their viewable area. A splitter window that separates the lists also allows the user to choose how large the viewable area is for each

A schedule consists of configured ping operations. The only operation that can be scheduled is the ping operation. Only the Admin can manage schedules (create, edit, delete, acknowledge, enable or disable), everyone else can view the schedules and results as read only, other restrictions can only be applied through scope of command. There can be a maximum of 100 schedules, each containing up to 100 ping operations. A schedule cannot have more than 10 pings per source per minute in one schedule. For example, if the frequency for a schedule is 2 minutes, there cannot be more than 20 pings configured per source in that schedule. This limitation is based on the CLI command and response from the node for pings. This limitation does not take into account timeouts and errors from the ping operations. If an iteration of a schedule is still running and another iteration of the same schedule is supposed to run (e.g. frequency is one minute and the first iteration takes 1minute 10 seconds), it will be skipped.

If a schedule is running, and a user tries to invoke an operation to the same router, they will be warned and the operation will be queued. If a user is

currently performing an operation on a router and a schedule runs with the same source defined, the user operation is cancelled and the user is notified. The schedule has priority at all times. Each schedule is defined by a user-defined name, by default it is date and time of the schedules creation. Schedules can be enable and disabled by selecting the check box beside the associated schedule (see Figure 0-8). To configure a schedule, double click it or select "Schedule->Edit" from the menu.

When a schedule is chosen, the operation list is updated with all the ping operations associated with that schedule. The Status field in the operation list only changes if there is an alarm or error associated to that operation. An operation can be added to a schedule in one of 3 ways:

1. Retrieve operations - Use "File->Open Operations" to retrieve a list of operations from a file to a selected schedule. If the specified file contains traceroute operations, they will be ignored and only ping operations will be retrieved.
2. Create operation - Use the "Operation->New->Ping" to add a new operation to the selected schedule.
3. Drag and drop/Cut, copy and paste operations - Use operations from the Operation window or another schedule and either drag and drop them (move the operations) or cut, copy and paste them into the selected schedule.

The result list contains all the summary information that exists for the selected operation. The summary information includes the time it was calculated, jitter, average delay, minimum delay, maximum delay, packet loss and status. Each summary can be expanded to display all the individual pings that were used to determine that summary information. The Status field in the result list only changes if there is an alarm or error associated to that summary information.

A schedule can associate one alarm for each of the following attributes:

- Jitter (ms)
- Maximum Delay (ms)
- Packet Loss (ms)

The schedule determines if an alarm is generated for one of the attributes by using a threshold. If the summary statistic for that attribute has exceeded the user-specified threshold, an alarm will be raised to the fault management system with the user-specified severity. The calculation is based on a summary period (i.e. a number of summaries). All summary statistics and individual operation results are stored on the server.

The Scheduling window contains common functionality that is used in the Operation window.

ix. Launching IP Maintenance and Diagnostics Scheduling Window

Selecting "Administration->IP Diagnostics Schedule" from the NMS main menu opens the IP Maintenance and Diagnostics client. Restriction of this command is only done through scope of command for the main menu; there are no other restrictions to opening the window. It can be displayed at any time, a router or node does not have to be selected. If a valid router or node is selected when the window opens, it will by default be the specified source object with the name and IP address already filled in for the source field for a ping dialog. If it is an invalid object, the source fields will be blank and the user will have to specify a valid router or node. The user is allowed to open only one scheduling window at a time. If the user selects the IP Diagnostics Schedule menu a second time, and the window is already launched, it will bring it to the front for the user. The IP Maintenance and Diagnostics operation window can also open the schedule window with the "File->Schedule Window" menu item.

x. Status Bar

The status bar is enhanced for the scheduling window. It displays an icon if the scheduler is currently running (i.e. a schedule is currently being processed). The icon only appears on the scheduling window when there is schedule being processed (see Figure 0-8). See section xxiv for a list of the common status bar features.

xi. Menus and Toolbars

Icon	Menu Item	Shortcut	Description

		Key	
	Schedule->New	?	Create a new schedule (only admin) and display the schedule options dialog. By default, all new schedules are disabled.
None	Schedule->Edit	?	Edit the selected schedules (only admin) parameters through the schedule options dialog.
None	Schedule->Enable/Disable	None	Enable/Disable the schedule (only admin) on the server (starts/stops it running)
None	Schedule->Delete	None	Delete the schedule (only admin)
None	Operation->Acknowledge	None	Acknowledge the alarms associated to the operation (only admin)
	Operation->Refresh	?	Refresh the summary statistics and status of the selected operations
	File->Operation Window	None	Open the Operation window
	File->Backup Window	None	Open the Schedule Backup window

Table 0-9: Menu items and associated Toolbar Icons

Common menu items and toolbars are found in Section xxv. The menu items identified in Table 0-9, are specific to the IP Maintenance and Diagnostics Scheduling window.

xii. Saving Summary Results and Individual Results to a Local File

Schedule and operation results can be saved to a local file in one of two formats, CSV or TXT. See section xxvii for a description of the save dialog.

Text Format

Schedule Customer A - VPN1

Ping Toronto - Ottawa Time 12:21pm 2003/01/10

Source138.120.15.90: vrf - vpn1 Destination 13.13.13.2

Seq	Source	Destination	Delay (ms)
1	138.120.15.90	13.13.13.2	112
2	138.120.15.90	13.13.13.2	Node Unreachable

3 138.120.15.90 13.13.13.2 98

Schedule Customer A - VPN1

Ping Toronto - Ottawa Status Delay Alarm

Source138.120.15.90: vrf - vpn1 Destination 13.13.13.2

Time 12:20pm 2003/01/101

Jitter (ms) 10.0

Packet Loss % 0.0

Average Delay (ms) 10.0

Maximum Delay (ms) 10.0

Minimum Delay (ms) 10.0

Figure 0-3: Schedule Text Format Example (Ping Detail and Ping Summary)

When the user selects the text format for saving results ("Save as Type" field), it will save it in a standard space formatted file (see Figure 0-3 for an example). The text file will contain either the summary statistics for the selected operations, or the individual results for the selected summaries.

CSV Format

Schedule, Customer A - VPN1

Ping, Toronto - Ottawa,Time,12:21pm 2003/01/10

Source,138.120.15.90: vrf - vpn1,Destination,13.13.13.2

Seq, Source, Destination, Delay (ms)

1, 138.120.15.90, 13.13.13.2,112

2, 138.120.15.90, 13.13.13.2,Node Unreachable

3, 138.120.15.90, 13.13.13.2,98

Schedule, Customer A - VPN1

Ping, Toronto - Ottawa, Status, Delay Alarm

Source,138.120.15.90: vrf - vpn1,Destination,13.13.13.2

Time,12:20pm 2003/01/101

Jitter (ms),10.0

Packet Loss % ,0.0

Average Delay (ms),10.0

Maximum Delay (ms),10.0

Minimum Delay (ms),10.0

Figure 0-4: Schedule CSV Format Example (Ping Detail and Ping Summary)

When the user selects the CSV format for saving results ("Save as Type" field), it will save it in a comma separated formatted file (see Figure 0-4 for an example). The file will contain either the summary statistics for the selected operations, or the individual results for the selected summaries.

xiii. Schedule List

Column	Description
Enabled	This is a checkbox to enable or disable each schedule from running
Schedule	The unique name of the schedule (see section xviii).
Start Time	The start time of the schedule
End Time	The end time of the schedule
Frequency	The time between each running of the operations
Freq. Period	The type of frequency (i.e. days, hours, minutes, etc)
Alarm Status	Identifies the highest severity alarm for the schedule (that has not been acknowledged).
Status	The status of the schedule, derived from the highest operation status

Table 0-10: Parameters displayed in the schedule list for each schedule

The schedule list contains the schedules that have been configured in the system. It identifies each schedule by its unique name in the "Schedule" column (see Table 0-10). It allows the user to enable/disable schedules by clicking the checkbox contained in the "Enabled" field associated to the schedule. It also identifies the time and frequency that this schedule is configured with. A schedule can be edited by double clicking the schedule entry in the list, it will then display the schedule configuration window (see section xviii).

Item	Description
New	Create a new schedule
Delete	Delete the schedule(s) from the list

Table 0-11: Menu items for the operation list popup menu

There is a popup menu that is associated to the schedule list that allows the user to create and delete operations easily (see Table 0-11).

xiv. Operation and Summary Status

Icon	Description
	Critical Alarm – A critical alarm has been generated based on summary statistics for the operation not meeting the schedules threshold values.
	Major Alarm – A Major alarm has been generated based on summary statistics for the operation not meeting the schedules threshold values.
	Minor Alarm – A Minor alarm has been generated based on summary statistics for the operation not meeting the schedules threshold values.
	Warning Alarm – A warning alarm has been generated based on summary statistics for the operation not meeting the schedules threshold values.
◆	Error - An error has occurred with the operation in a summary period.
✔	Normal – The operation has no errors or alarms associated to it.

Table 0-12: Status values for each Operation in the Operation List

Icons in the schedule list, operation list and result list represent the associated status values; see Table 0-5 for a list of the status icons and their description.

The operation list and schedule list derive their status from the highest status in the summary list.

xv. Operation List

Column	Description
Type	The type of operation (see Table 0-14).
Name	The Name associated to the operation.
Source	The router the operation is being performed on
Destination	The object the operation is being performed to
Alarm Status	Identifies the highest severity alarm for the schedule (that has not been acknowledged).
Status	The status of the operation (see section xiv for a list of status values).

Table 0-13: Parameters displayed in the operation list for each operation

The operation list contains the list of ping operations contained in a schedule. The operations appear in the order they are added. The status field identifies errors or alarms associated to the operation (see Table 0-13). The status field is derived from the highest alarm in its summary list. The source and destination columns identify the configured source and destination objects for the ping operations. IP Maintenance and Diagnostics Scheduling supports 10 ping operations per minute per node. The maximum number of operations per schedule is 100.

Icon	Description
	Ping Operation

Table 0-14: Icon representation of the "Type" field in the Operation List

The list will contain all the defined ping operations created by the user and they are distinguishable by the "Type" column (see Table 0-14). Operations in a

schedule may not be done the current iteration before the schedule needs to run again (e.g. based on timeout issues and conflicts with other schedules). If an iteration of the operation is missed due to this, the summary information will have an error status with an error message identifying this summary as "skipped". This may mean the user will have to adjust times or frequencies in this schedule or other schedules. An operation could also have an error status if there was a configuration error (e.g. the specified LSP name has changed on the node).

Item	Description
Refresh	Refresh the summary information for the selected operation.
Acknowledge	Acknowledge the alarms and errors associated to the operation
Delete	Delete the operation(s) from the list
Save Operations	Save the operation(s) for future use
Save Results	Save the summary information from the selected operation file (see section xii).
Highlight	Highlight all known objects associated with the selected operation (see section xxxi)

Table 0-15: Menu items for the operation list popup menu

Double clicking on an operation in the operation list will open the appropriate operation window to allow the user to change any options for that operation. The user can control one or more operations by selecting them (highlighting one or more operations) and right clicking. This will produce a popup menu containing the control information for the selected operations (see Table 0-4). The popup menu allows quick access to operations such as refresh for getting the latest results and highlight for highlighting the associated objects. If one or

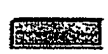
more alarms have occurred for an operation, the user can acknowledge (clear) the alarms through the popup menu.

xvi. Result List

Column	Description
Time	The time the summary statistics were calculated
Packet Loss (%)	The percentage of packets sent, that never reached the destination during the summary period.
Jitter (ms)	Variance in delay in individual packets sent to the destination.
Maximum Delay (ms)	The slowest response time from the destination during the summary period.
Minimum Delay (ms)	The quickest response time from the destination during the summary period.
Average Delay (ms)	The average response time from the destination during the summary period.
Alarm Status	Identifies the highest severity alarm for the schedule (that has not been acknowledged).
Status	The status of the summary (see section xiv for a list of status values).
Details 	This button in the Details column will display the Summary Ping List dialog window with the associated individual ping results for the selected summary.

Table 0-16: Parameters displayed in the result list for each operation

The result list contains the summary results from each operation. If multiple operations are selected, the result list contains the entries from the first selected operation only. The results retrieved for the selected operation are only the ones that exist to that time. If new results come in, the UI will not be updated, but the user can refresh the summary results at any time. The results appear in order based on the time they were calculated (see Table 0-16). The status of the summary could either be normal, an error or an alarm (see section xiv).

With each summary, a list of individual pings is associated to it. These ping values are used when calculating the summary statistics. The list of the entire ping for that summary can be viewed in a separate window (see Figure 0-9). To display this list window, the user can press the  button (in the "Detail" column) contained in the row associated to the summary or double click the

summary. The window will display the time when each ping was performed, the delays associated to each ping and any errors (e.g. Node Unreachable).
Storing all summary and detailed ping information can be quite large. Therefore there are limitations of disk size associated to the IP Diagnostics Scheduling. If the limitation is exceeded, the oldest results for operations will be deleted and will not be retrievable.

Item	Description
Save Results	Save the individual ping results to a user specified file (see section xii).

Table 0-17: Menu items for the result list popup menu

The user can perform actions on each result by selecting it in the result list and right clicking. This will produce a popup menu containing the control information for the selected results (see Table 0-7).

xvii. Response Pane

The response pane only displays execution errors. If an execution error has occurred in the operation or for a specific summary, the response pane will show the error message (see Figure 0-7). An execution error occurs not with an ICMP packet, but an error in the CLI command, such as invalid VRF name, or timing issue with other schedules. All operations are logged to a central server file; it includes each packet and any errors (see section 1.a.xxxiv).

xviii. Schedule Configuration

A new schedule can be created at any time by selecting "Schedule->New. If the parameters are changed for a schedule, they will take effect the next time the schedule runs. This means that any individually calculated threshold value and summary values on the server would be reset, previous results will still be available.

The scheduling configuration window contains 3 tabs, general, schedule and thresholds (see Figure 0-11). This window contains all the necessary fields to configure a schedule.

Item	Values	Default	Size	Description
Schedule Name	N/A	N/A	30 Char	The unique identifier (name) of the schedule.
Number of Pings	1 - 255	3	Short	The number of pings to send in a ping operation.
Interval (sec)	1 - 255	3	Short	The time to wait before issuing the next ping.
Packet Size (bytes)	29 - 9192	32	Short	The packet size of each ping. (frozen in this release).
Fill Pattern	N/A	0XAB CDAB CD	32 bits	The value to pad the ping packet with (frozen in this release).
Timeout per Ping (ms)	0 - 60000	20000	Short	The timeout period to wait for a response (frozen in this release).
Type of Service	0 - 255	0	Short	The type of service, or DSCP bits (frozen in this release).

Table 0-18: Fields in the General Tab

The fields contained in the general tab are used for basic information identifying the schedule, such as a unique name (see Table 0-18). The ping setting fields are applied to all ping operations contained in the schedule. The fields that apply to pings in the schedule are identical to the standard parameters for normal ping operations. In this release, the values are frozen to the default values.

The schedule tab is used to set the start time, end time and the frequency (in minutes) to run the schedule. This will set the frequency or the number of times the schedule will run (see Figure 0-12).

Item	Values	Default	Size	Description
Frequency	Per Minute	Per Minute	N/A	The frequency of the schedule (i.e. when it runs).

Process Every	0 min – 60 min	15 min	Short	The time between each run of the schedule (increments of 1 minute)
Start Date	N/A	Current Date	dd:mm:yyyy	The date for this schedule to start running
Start Time	N/A	Current Time	String	The time for this schedule to start running
End Date	N/A	Current Date plus one day	dd:mm:yyyy	The date for this schedule to start running
End Time	N/A	Current Time	String	The time for this schedule to start running

Table 0-19: Fields in the Schedule Tab

The frequency field in the schedule tab identifies the time between each run of the schedule. Currently it only allows a frequency from 0 minute to 60 minutes (see Table 0-19). If the user specifies a frequency of 0 minutes, it will only run the schedule once at the specified start date/time, the end date/time are ignored. The start date/time and the end date/time must take the frequency into account. For example, if the start date/time is 2003-02-28 12:10pm, and the frequency is 15 minutes, the end date/time must at least be 2003-02-28 12:25pm. Schedules may overlap; there is no validation between the schedule being configured and existing schedules. This will not be a problem unless the same source router is in more than one schedule that may run at the same time. If schedules run at the same time, the operations contained in those schedules do not have an order, so operations from one schedule could be interspersed with operations from another schedule. If a schedule cannot complete within the specified frequency, the next iteration of the schedule will be skipped. The summary period and individual ping will identify when it has been skipped, by setting the status to "Error" and displaying an appropriate error message. No scheduled ping for a given source router will be able to be executed if another ICMP operation is in progress on the source router. An error will be recorded for that individual ping.

The threshold tab is used to set the threshold values for Jitter, Delay and Packet Loss %.. This will set the summary period as well, the number of iterations that the schedule runs before calculating the summary statistics and creating alarms (see Figure 0-13).

Threshold	Item	Values	Default	Size	Description
N/A	Summary Period	5 - 1440	30	Short	The number of iterations before calculating the summary statistics.
Jitter (ms)	Value	0 – 60000	0	Short	The maximum variance in milliseconds before a jitter alarm is raised. A specific severity of alarm can be associated to this threshold value.
	Severity	Critical Major Minor Warning	Warnin g	N/A	
	(checkbox)	Disabled Enabled	Disable d	N/A	Enables or disables this threshold value. If disabled, the fields become read-only.
Delay (ms)	Value	0 – 60000	0	Short	The maximum delay in milliseconds before a round trip delay alarm is raised. A specific severity of alarm can be associated to this threshold value.
	Severity	Critical Major Minor Warning	Warnin g	N/A	
	(checkbox)	Disabled Enabled	Disable d	N/A	Enables or disables this threshold value. If disabled, the fields become read-only.
Packet Loss (%)	Value	0 – 100	0	Doubl e	The number of connectivity failures allowed before a connectivity alarm is raised. A specific severity of

	Severity	Critical Major Minor Warning	Warnin g	N/A	
	(checkbox)	Disabled Enabled	Disable d	N/A	Enables or disables this threshold value. If disabled, the fields become read-only.

Table 0-1: Fields in the Threshold Tab

The summary period field identifies the number of iterations to wait before calculating summary statistics and determining alarms (see Table 0-1). The minimum summary period is 5 and the maximum 1440. For example, if the summary period is 5 and the frequency for a schedule is 1 minute, then the summary statistics will be calculated after 5 minutes. If an iteration is skipped, then that iteration will not be included in the summary period. Execution errors, such as invalid VRF name, are not used in summary calculations or alarm determination. The threshold fields identify the threshold limit and the associated alarm severity to use if an alarm is raised.

xix. Alarms and Threshold Highlighting

When an alarm is generated for a summary period, that summary and the associated operation have their status shown in the window as an "alarm" state (see section xiv). The user can highlight in the scheduling window the same way as the operation window (see section xxxi). The user can then select any or all operations that have an alarm associated with them and perform "Operation->Highlight". This will highlight all source and destination objects for all the selected operations in a schedule.

For each alarm generated to the NMS fault management system, the following information will be available for each alarm:

- Schedule Name
- Operation Name
- Source Node (VRF and LSP if applicable)

- Destination IP address
- Summary Execution Time
- Threshold that failed (Loss, Jitter, or Delay) - This will be the "probable cause" field in the AS system.
- Threshold value
- Result that caused the threshold failure

The alarm will be raised as a QoS type of alarm. After an alarm has been raised, the user can acknowledge (clear) the alarm in the IP Diagnostics Scheduling window. This will change the status of the operation and the schedule back to a normal state until another alarm is raised. This action is not associated to clearing the alarm in the Fault Management system, it is only associated to the IP Diagnostics Scheduling application. Likewise, with the AS system, If a user clears an alarm it does not clear it in the IP Maintenance and Diagnostics Scheduling application. If a schedule should not raise alarms, the default value of "0" should be used in the fields for the threshold that is not being used. The thresholds are defined by each individual schedule (see section xviii).

xx. Schedule Backups

The schedule backup window is very similar to the regular functionality of the IP Maintenance and Diagnostics Schedule Window. This includes saving results to a local file, copying operations to be used in the Schedule Window or Operation Window, highlighting selected operations, viewing specific detailed results per summary, and viewing the configuration of the stored operations in the operation list. There are only three differences:

1. All operations and schedules are read-only. You can view, but you can not edit.
2. The schedule list contains a list of backup files (many per schedule).
3. Alarms and errors are only visible at the result pane level, they are not visible in the operation or schedule.

There are no restrictions on who can view the schedule backups. There is no limit to the number of backup files for a schedule, the only limitation is disk space.

xxi. Launching IP Maintenance and Diagnostics Schedule Backup Window

The only way to launch the Schedule Backup Window is through the Schedule Window, under "File->Backup Window". There are no restrictions to who can launch this window, the only restriction is based on the scope of command for the Schedule Window. The user is allowed to open only one Schedule Backup Window at a time. If the user selects the menu a second time, and the window is already launched, it will bring it to the front for the user.

xxii. Menus and Toolbars

Icon	Menu Item	Shortcut Key	Description
	Schedule->Refresh	?	Refresh the summary statistics and status of the selected operations
	File->Schedule Window	None	Open the Schedule window

Table 0-2: Menu items and associated Toolbar Icons

Common menu items and toolbars are found in Section xxv. Any configuration type menu items identified in Section xxv do not apply to this window. The menu items identified in Table 0-9, are specific to the IP Maintenance and Diagnostics Scheduling Backup window.

xxiii. Redundancy

The Active NMS machine contains the main repository for summary and operation results. The repository is copied to the Standby NMS in case of Active failure. The repository is synchronized between the active and standby. In the event of a switch over the clients will switch over to the Standby (or new active) to retrieve the summary and operation results. The backup directory is not synchronized between the active and standby, this must be done by the customer.

Common IP Maintenance and Diagnostics Functionality

This section describes common functionality used by both the IP Maintenance and Diagnostics Operation Window (see Figure 0-3) and the IP Maintenance and Diagnostics Scheduling Window (see Figure 0-8).

xxiv. Status Bar

The main window contains a status bar at the bottom. The status bar displays the number of operations in the operation list and status messages. These status messages depend on the operation that is currently selected. It is a description of the current state the operation is in. For example, if an operation has been initiated but no response is back, it will display the message "In Progress...".

xxv. Multi-Column Sorting

All tables in the Operation and Scheduling windows allow sorting by columns. Each table can be sorted by multiple columns, in ascending or descending order. Clicking the header of a column will sort it in ascending order, clicking it a second time reverse the order. As columns are clicked, they will be sorted in the order they are clicked, with the last column being the first column sorted. To remove a column from the sort, hold the ctrl key and click the column to remove, it will no longer be included in the table sort.

xxvi. Common Menus and Toolbars

Icon	Menu Item	Description
	File->Save Result As	Save results from an operation to a file as text or CSV format.
	File->Save Operations	Save the Operation List.
	File->Open Operations	Retrieve the Operation List.
	Edit->Cut	Cut the operation
	Edit->Copy	Copy the operation
	Edit->Paste	Paste the operation
	Operation->New->Ping	Open the Ping window for creation.
None	Operation->Edit	Edit the selected Operation

	Operation->Highlight	Highlight the selected operation.
	Operation->Delete	Delete the operation from the Operation List.
None	Result->Highlight	Highlight the selected result from the operation.
	Help	Display the help window for IP Diagnostics.
None	File->Exit	Exit the IP Diagnostics Application.

Table 0-3: Menu items and associated Toolbar Icons

Table 0-1 above describes the functionality associated with each menu item, its toolbar icon, and its shortcut key. Some of the menu items are available in popup menus on the operation, schedule and result list. All dialogs opened in the IP Maintenance and Diagnostics windows are modal to that window only, and will not disable any other application.

xxvii. Saving Results to a Local File

Operation results from one or more operations/schedules can be saved to a local file. It allows the user to select one or more of the objects and save the results to a file. The user can choose the directory and file name, along with one of two file formats, Text and CSV. The default directory when the window is opened is the user home directory and the default file type is CSV. If the user selects an existing file, it will notify the user that the file exists, and ask if they wish to overwrite it. The format of the results from the scheduling window and the operation window are different, refer to section xii for an example from scheduling window and section v for an example from the operation window.

xxviii. Retrieving an Operation List

The entries in the Operation List can be retrieved from a user-specified file. To retrieve a saved operation list, select "File->Open Operations" from the main menu. A dialog will appear (see Figure 0-16) that will allow the user to specify a file containing an operation list. The file type is a specific one to the client, and cannot be manually edited by the user, so the "File of Type" field is frozen

to this value. Once the file is specified, the operation list will be updated to contain the operations from the file and the existing operations. The values are not validated at the time the file is loaded only when the operation is initiated or the schedule runs. The default directory when the window is opened is the user home directory.

In the Operation window, the status field will be blank, as it appears when an entry is first manually added to the list through the client, until the operation(s) are initiated at least once. The last results for the retrieved operations are not available and will appear blank if an operation is selected before it has been initiated at least once.

In the Scheduling window, the operations will be retrieved to the currently selected schedule. The summary results and status will be blank until the schedule runs at least one time.

xxix. Save an Operation List

The entries in the operation list can be saved to a user-specified file. To save an operation list, select the operations to save and select "File->Save Operations" from the menu. A dialog will appear (see Figure 0-17) that allows the user to specify a file to save the operation list to. The default directory when the window is opened is the user home directory. If a file exists with the name specified, it will ask the user for verification that they want it overwritten. After the user selects "Save", the file will be updated to contain the operations selected by the user, including any parameters to the operations. The file is a specific type to the client and cannot be edited manually by the user. Only the configuration of each operation is saved, the status and results are not stored in the file. Once the operations are saved to a file, they can be used on other workstations. The file must be transferred manually by the user to the other workstation, but once it has been transferred, the client on that workstation can then retrieve the list of operations.

In the Operation window, if the user closes the client, and the operation list has changed since the last save, it will popup a warning message and allow them to save the operation list before exiting the client.

xxx. Valid Source and Destination Objects

The source and destination objects are specified in the appropriate operation window. Both ping and traceroute have the same valid source and destination objects.

Source

The source field is used to define what router the ping or trace route operation is coming from. The following is a list of valid objects that could be specified in the source fields:

- Router
- Router Interface (the source endpoint identifies the source router and VRF name if one is specified)
- Node
- First Hop LSP (the source router will be determined by the source endpoint of the LSP)

If a supported Router or Node is specified as the source, then the VRF Name can be specified. This field is not enabled if a first hop LSP is selected as the source first (i.e. an LSP and VRF name can not be specified at the same time).

To specify a router, node or LSP, the user can select it in another application (i.e. make it the selected object) and paste it in (see Figure 0-3). If an invalid object is selected, an error message is displayed to the user. If it is an LSP that is pasted in, the Router and IP Address fields will be filled with the information from the source endpoint of the LSP. This includes the management IP address and name of the source Router.

Selecting a router interface and pasting it in can specify the source router or node. It will automatically fill in the associated IP Address and Router name. If a VRF name is associated to the router interface, it will automatically fill in the VRF name.

Another way to specify a router or a node is to query on the management IP Address. The user can enter the IP Address in the IP Address field and then press "Enter". If this is the management IP address of a supported router or node, its name will be filled in. If it is an unsupported node or router, an error message is displayed to the user.

The user can specify a VPN by filling in the VRF name in the source field. A valid router or node must also be specified. The NMS does not validate the name, instead it will be done at the time the operation is initiated on the router. If the router finds a problem with the specified VRF name, an error will be displayed to the user in the response area. A VRF name cannot be selected at the same time as the LSP.

The object type that is being used to define the source must have the radio button selected beside the type. For example, if the source is defined by the LSP, the radio button beside the LSP field must be selected. The radio button selection defines which fields are enabled for that object type.

Destination

The destination fields are used to define what object the ping or trace route operation is going to. The following is a list of valid objects that could be specified in the destination fields:

- Any IP address (whether it is a NMS managed object or not)
- Router ID (Router managed by the 5620)
- Node (specified with an IP Address)

Pasting in one of the following objects known to the NMS can also specify a destination:

- Router Interface (the destination endpoint will be the router interface IP address, in the case of unnumbered, it is the router ID)
- LSP (the destination router will be determined by the destination endpoint of the LSP)

To specify an object by IP Address or Router ID, enter the value in the IP Address field. If this is a Router ID of an object that the NMS is managing, its name will appear in the destination field. If it is an IP Address, the destination

field will say "Unknown". To specify a node that isn't in the list of supported nodes/routers (e.g. 7470) the user must enter the IP address of the destination object. There is no support for pasting in an object that does not have routing capabilities.

To specify a router, node, router interface, or LSP, the user can select it in another application (i.e. make it the selected object) and paste it in (see Figure 0-3). This action will also fill in the IP Address field with the objects IP Address, or in the case of a router or node, the Router ID. If it is a router interface, it will fill in the Router ID and IP Address of the router the interface is on. If it is an LSP, it will fill in the Router ID and IP Address of the destination endpoint of the LSP. If an invalid object is selected, an error message is displayed to the user.

The object type that is being used to define the destination must have the radio button selected beside the type. For example, if the destination is defined by the LSP, the radio button beside the LSP field must be selected. The radio button selection defines which fields are enabled for that object type.

xxxi. Drag and Drop/Cut, Copy, and Paste

Operations can be moved from the operation window to the scheduling window (and between schedules) by one of 2 methods, Drag and Drop and/or Cut, Copy and Paste. The Drag and Drop method allows the user to select multiple operations, click the mouse and drag those selected operations to the other window. The Cut, Copy and Paste method allows the user to select multiple operations, click a cut/copy menu item (see section xxv) and then paste on the other window. Valid windows to select operations are the operation lists in the scheduling window or the operation window. Valid drop areas are the operation lists in the scheduling and operation window, or a schedule in the schedule list window. Currently the only supported operation is the ping operation. If the user tries any other type of operation an error will be displayed.

xxxii. Highlight

Ping and Traceroute operations can be highlighted using the existing highlight functionality in the 5620. Any objects managed by the NMS can be highlighted, including routers, nodes and IP Links. Any NMS application that supports highlighting will highlight the objects specified by the user in the IP Maintenance and Diagnostics application. These applications include but are not limited to the IP Map, NMS Map, Object Navigator, and the listing tools.

All highlight operations in the IP Maintenance and Diagnostics window are performed through either the operation list popup menu, or the result list popup menu (see sections vi and vii respectively, for information about the popup menus). However, depending on what the selected operation is, different objects will be highlighted. For the operation list, the following objects are highlighted based on the operation:

- Ping - The source and destination objects are highlighted (i.e. Router and Node).
- Traceroute - The source object, destination object, and all the hops between (including the IP Links) are highlighted (i.e. Router, Node, and IP Link).

For example, highlighting a traceroute operation that contained the following:

Source:1.1.1.1	Hop1: 2.2.2.2	Hop2: 3.3.3.3	Destination: 4.4.4.4

Would highlight the source Router, the IP Link, and Router to hop1, the IP Link, and Router to hop2, and then the IP Link, and Router at the destination (this includes all parent objects, such as Nodes).

If a specific entry in the result list is selected and "highlighted", and it is an object that is managed by the 5620, the selected entry, if managed by the 5620, will be highlighted. If a VRF name is specified in the operation, it will be used when determining what objects to highlight. This will only affect the IP Link that is highlight going to the customer edge. If an LSP is defined in the operation, it will not be highlighted. The source and the LSP's associated destination (if managed by the 5620) will be highlighted. In the case of a

traceroute, the hops that are contained within an LSP will not show up in the results, and will not be highlighted. Any hops outside of the LSP will be highlighted. There is no highlighting of objects inside the IP Maintenance and Diagnostics window.

xxxiii. **Operations**

This section contains definitions of all operations supported by IP Diagnostics and Maintenance.

Ping Operation

The ping operation is used to check network connectivity between the source and destination (see Figure 0-18). The source is where the ping is being initiated from (see section 0 for a list of valid sources) and the destination is where the ping is being sent to (see section 0 for a list of valid destinations).

To create a ping operation, select "Operation->New->Ping" from the menu (or the shortcut identified in Table 0-1). It will open the Ping Operation dialog (see Figure 0-19). From here the user can specify all the parameters for the ping operation.

Item	Values	Default	Size	Description
Name	String	Full Name of source router	32	Name for the ping operation
Source	N/A	(see section iii)	N/A	The router the operation is coming from.
Destination	N/A	N/A	N/A	The object the operation is going to.
Number of Pings	1 - 255	3	Short	The number of pings to send in a ping operation.
Interval (sec)	1 - 255	3	Short	The time to wait before issuing the next ping.
Packet Size (bytes)	29 - 9192	32	Short	The packet size of each ping. (frozen in this release).
Fill Pattern	N/A	0XABCDABCD	32 bits	The value to pad the ping packet with (frozen in this release).

Timeout per Ping (ms)	0 - 60000	20000	Short	The timeout period to wait for a response (frozen in this release).
Type of Service	0 - 255	0	Short	The type of service, or DSCP bits (frozen in this release).

Table 0-4: Fields displayed for each ping operation

The parameters that can be filled in for each ping operation is standard options, such as "Number of Pings" and "Type of Service" (see Table 0-4 for a list of all the parameters). Once the source, destination, and parameters are specified, the ping can then be added to the operation list by clicking the "Add" button. The ping does not automatically start once its added to the list, it must be "initiated" before it will try and execute the operation on the router (see section vi for a description of the operation list). Once the ping is complete, the results are displayed in the result list and response pane (see sections vii and viii respectively). The results displayed for a ping operation are not saved by the 5620, if the user does not save the results to their local workstation, they will be lost when the client closes or the operation is initiated again.

The result list contains each individual ping that was sent in the selected ping operation. It displays specific information such as delay and ping sequence number for each individual ping. The response pane will display statistics associated with the entire ping operation. If the ping is not yet complete, the response pane will display an "In Progress..." message to the user in the progress bar. The user can change the parameters associated to a ping operation only when the operation is not in progress, by double clicking it in the operation list, or selecting it and executing "Operation->Edit". This will open the Ping window with the values associated to that operation and allow the user to change any of the parameters associated to the selected operation.

Traceroute Operation

The traceroute operation is used to determine the route taken by packets from a source to a particular host (see Figure 0-20). The source is where the traceroute

is being initiated from and the destination is where the traceroute is being sent too.

To create a traceroute operation, select "Operation->New->Traceroute" from the menu (or the shortcut identified in Table 0-1). It will open the Traceroute Operation dialog (see Figure 0-21). From here the user can specify all the parameters for the traceroute operation.

Item	Values	Default	Size	Description
Name	String	Full Name of source router	32	Name for the ping operation
Source	N/A	(see section iii)	N/A	The router the operation is coming from.
Destination	N/A	N/A	N/A	The object the operation is going to.
Source	N/A	(see section iii)	N/A	The router the operation is coming from.
Destination	N/A	N/A	N/A	The object the operation is going to.
Maximum TTL	0 – 64	30	Short	The maximum time to live (frozen in this release).
Probes per Hop	3	3	Short	The number of "pings" to each hop in the route (frozen in this release).
Interval (sec)	1 - 255	3	Short	The time to wait before issuing the next traceroute (frozen in this release).
Packet Size (bytes)	29 - 9192	32	Short	The packet size of each probe (frozen in this release).

Fill Pattern	N/A	0XABCDABCD	32 bits	The value to pad the packet with (frozen in this release).
Timeout per Probe (ms)	0 - 60000	3000	Short	The timeout period to wait for a response (frozen in this release).
UDP Port	0 - 65535	33434	Short	The port to send the traceroute to (frozen in this release).

Table 0-5: Fields displayed for each traceroute operation

The parameters that can be filled in for each traceroute operation are standard options, such as, "Probes per Hop" and "UDP Port" (see Table 0-5 for a list of all the parameters). Once the source, destination, and parameters are specified, the traceroute can then be added to the operation list by clicking the "Add " button. The traceroute does not automatically start once it's added to the list; it must be "initiated" before it will try and execute the operation on the router (see section vi for a description of the operation list). Once the traceroute is complete, the results are displayed in the result list and response pane (see sections vii and viii respectively). The results displayed for a traceroute operation are not saved by the 5620; if the user does not save the result locally, they will be lost when the client closes or the operation is initiated again.

The result list contains each individual hop that was sent in the selected traceroute operation. It displays specific information such as delay for each individual hop. The response pane will display statistics associated to each individual hop (i.e. the currently selected hop) in the traceroute operation. If the traceroute is not yet complete, the response pane will display an "In Progress" message to the user in the status bar. The user can change the parameters associated to a traceroute operation only when the operation is not in progress, by double clicking it in the operation list, or selecting it and executing "Operation->Edit". This will open the Traceroute window with the

values associated to that operation and allow the user to change any of the parameters associated to the selected operation.

xxxiv. Historical Log

The results from all operations are logged by the server to a log file. Every time a schedule is run on the server, it identifies it in the log file. This file cannot be displayed through the client, but is available to the user on the server host in a text file. The log contains the main log, and a backup. When the main log grows to the maximum size, it is copied to a backup and the main log will be cleared. The files can grow very large over time; hence they are restricted to a set amount of disk space. If the files grow too large, the oldest results are deleted to make space for the new results (i.e. the backup file is overwritten). However, the size of the files is configurable for each server. If a switchover happens from the active to the standby, the history log is not copied to the standby workstation.

Standard CORBA Interface to Other Applications

The control of the ping and traceroute operations as well as the scheduled operations, to the source routers resides in an IP Maintenance and Diagnostics server. This process contains the control to the router(s) for issuing the operations. This allows rules associated to each type of router to be removed from the client, making the server a common interface to all supported routers

The interface used by the IP Maintenance and Diagnostics client is a CORBA interface (see Figure 0-22) that gives other applications the ability to use the services provided by the IP Maintenance and Diagnostics server. Using CORBA as the interface between a client and the server allows a generic communication without having to understand where the server is in a distributed network or what the specific interface to the server process looks like. The server will make public only the Ping, Traceroute, and Scheduling interfaces. The public interface to the server could be made public in the future for customer use, but security issues may affect this.

Performance

This feature will have an effect on performance. Each individual ping or traceroute on a router will not affect performance of the UI or the server.

However, if many operations are queued on the server or multiple schedules are running, going to multiple nodes, it will affect the performance of the server.

Scalability

The performance issue effects scalability in the number of ping/traceroute requests that can happen to the same router. It is also affected by the configuration of the schedules. Multiple schedules running at the same time will queue operations to routers and may result in iterations of the schedule being missed. This will have to be monitored by the users. Any missed iterations will be identified in each summary period. There is, at most, only one active session to a router at one time. This will restrict users from accessing the same router at the same time.

The operations are sent to the routers through CLIP and are queued on a router basis in CLIP. The limitation is from CLIP to the Router, only one active diagnostic session is allowed currently between CLIP and the router. CLIP will not stop other types of operations to the node (i.e. reconcile and configuration scripts) while diagnostics operations are in progress. All operations going to the same router in CLIP are queued and will be sent in order to the router, there is no concept of priority of the operations.

To increase scalability in the future, more support is needed from the nodes and CLIP. The ability to send multiple operations at one time without logging in for each operation and the ability to perform background operations such as ping will increase the scalability of the server.

Risk

This feature adds the ability for clients to send ICMP packets to routers in a network. There is some risk to sending these type of messages, without control it can affect performance on the routers. Ping is well known for denial of service attacks, where the number of pings and amount of data can slow down or stop any response from the routers. An attacker may also use these operations to find out the topology and vulnerabilities in the Network. There is security from the NMS perspective, which includes scope of command and the server queue where only one ping can be performed on the same router at one

time (i.e. as soon as the first ping is complete on a router, the second can start on that same router). However, this does not prevent a ping command from containing harmful parameters such as a large interval or large packet size. In this release it will not be an issue as the ICMP parameters are frozen and are not configurable.

EVOLUTION OF FUNCTIONALITY

Future Functionality

xxxv. Individual Ping Parameters per Schedule

Currently, the ping parameters are associated to all the ping operations in the schedule. It would be useful to associate the parameters per ping in the schedule.

xxxvi. Multiple operations in one session

The ping and traceroute operations to the node currently use a separate session into the node. This means each operation must connect, login, execute the command and logoff. It would improve performance if there were a way to connect, login, execute a series of operations and then logoff.

xxxvii. Scheduled Traceroute

The only operation that can be currently scheduled is the ping operation. There may be a need in the future to schedule traceroutes as well.

xxxviii. Ping and Traceroute from source NMS

Allow a network management station to perform a ping or traceroute. This would allow the users to test connectivity from network management stations.

xxxix. Hostname DNS lookup

In the future, it would be good to allow the user to specify a hostname and automatically lookup the IP Address from a DNS server. This would allow for pings and traceroute operations to publicly visible destinations.

xl. CVS control for historical logs

Adding the historical logs to a repository such as CVS. This could be added to change management for control of these historical logs.

xli. Central Repository for Operation Lists

Adding a central repository to store and version control operations lists (i.e. Change Management) would help users so they don't have to control where their operation list file is located and it is accessible from different machines.

REQUIREMENTS

Rq't #	Requirement
R1361-1.2.3.4	NMS shall allow the user to print results for operations in a schedule. The results will be printed in text format.
R1361-1.2.3.5	NMS shall allow the user to print information on selected schedules. The information for a schedule includes start/end times, threshold values and a list of its operations.
R1361-1.2.5.3	NMS shall allow profiles (sets) of alarm thresholds to be created and associated to one or more scheduled matrix of ping operations. Each profile can contain zero or more alarm thresholds for jitter, delay or loss. Each defined threshold will have an associated alarm priority. A schedule can only be assigned to one alarm threshold profile.
R1361-1.2.5.4	NMS shall allow users to highlight the Ping sources which do not meet the following user specified thresholds: • Delay Threshold • Jitter Threshold • Loss Threshold Highlighting is not automatic; it will be a separate step that the users have to initiate.
R1361-1.2.5.6	NMS shall allow users to highlight the affected Node from the AS system. Highlighting is not automatic; it will be a separate step that the users have to initiate.

FURTHER REQUIREMENTS

Rq't #	Requirement
R1317-1.1.11	NMS shall allow users to define a set/matrix of network points between which continuous background Ping operations will be executed. See R1317-1.4 for scalability limitation.
R1317-1.1.11.1	NMS shall allow users to specify a set of Ping sources and Ping targets for Ping operations. The Ping parameters as specified in R1317-1.1.7 – R1317-1.1.8 will be common to all the combination of Ping operations generated from the matrix.
R1317-1.1.11.2	NMS shall allow users to specify multiple sets of Ping matrix.
R1317-1.1.11.3	NMS shall allow users to specify a schedule for the Ping matrix. The schedule may include one or a combination of the following: • 'Now' or 'Date and time' the Ping operations are to be carried out 'Once only' or 'the interval' (e.g. every N x 15 minutes or every N hour after) at which the Ping operations are to be carried out
R1317-1.1.11.3.1	NMS shall prevent users from scheduling over-lapping matrices that may result in > 255 Ping commands being issued by the NMS at the same time. This is regardless of whether the commands are issued to the same or different Ping source.
R1317-1.1.11.4	The results as specified in R1218-1.1.9 shall be available for each of the Ping operations generated from the Ping matrix.
R1317-1.1.11.5	NMS shall allow users to highlight the Ping sources which do not meet the following user specified thresholds: • X number of connectivity failures over Y timeframe • Round Trip Delay Threshold • Jitter Threshold Highlighting is not automatic; it will be a separate step that the users have to initiate after the Ping operation is completed.
R1317-1.1.11.6	NMS shall allow users to enable alarm generation for Ping sources which do not meet the following user specified thresholds: • X number of connectivity failures over Y timeframe • Round Trip Delay Threshold Jitter Threshold

R1317-1.2.9 NMS shall display the following non-configurable Traceroute parameters in the Traceroute operation user interface:

- Maximum TTL
- Probes per hop
- Packet Size
- Time to wait before timing out per probe sent
- Data fill Pattern

UDP Port

R1317-1.4 NMS shall achieve the following scalability and performance targets:

- Support up to 255 concurrent Ping and Traceroute operations at a time regardless of whether the operations are issued to the same or different Ping/Traceroute sources.

- NMS shall not block the graphical user interface for more than 5 seconds after a user issues a Ping or Traceroute request.

  Results may bc displayed after a longer period of time depending on either the timeout set by the users or the response from the 7670 node, which ever happens first.

R1317-1.4.2

- Support up to 64 Ping matrix in the NMS system

- Support up to 255 entries in each Ping matrix

R1317-1.5 NMS shall provide an API for the Ping and Traceroute operations to other processes.

[69] Advantages provided by the proposed solution include

1. A simple solution to implement on a Network Management System because provisioning of the connectivity verification tests are centralized and do not require manual logging-on the particular source network nodes.
2. The solution provides schedule connectivity verification testing to be executed periodically, which saves the operator's time, thereby reducing a service provider's operating costs.
3. The solution increases the reliability, availability and serviceability of the IP connectivity by providing immediate alarms and results to be summarize for later analysis.

4. The solution enhances and simplifies the IP diagnostics and maintenance capability for solving service provider network problems. It also allows the customer to test the network provisioning prior to enabling a data service.
5. Because the management is done through a GUI associated with the NMS system, the configuration is much easier than using the legacy CLI on a per source network node (router) basis, which is error prone.
6. A further advantage includes being able to view/configure/modify/store the 'N' network connectivity verification tests and provide the resulting information immediately (through views or alarms) or historically in a network management context.

[70] Reducing operating expenditures is important service providers. The invention automates the diagnostics process of creating and maintaining connectivity test, thereby reducing the operating costs of carrying out these functions. This also ensures that IP connectivity meets the customer expectations as far a jitter, delay and loss of data. Furthermore, the invention reduces operating costs and increases reliability, both of which are valuable to service providers.

[71] The embodiments presented are exemplary only and persons skilled in the art would appreciate that variations to the above described embodiments may be made without departing from the spirit of the invention. The scope of the invention is solely defined by the appended claims.

WE CLAIM:

2. A network management connectivity verification framework comprising:

   a. a connectivity verification server performing unattended connectivity verification jobs; and

   b. a connectivity verification application for defining connectivity verification jobs, configuring the connectivity verification server accordingly, and displaying configuration verification results.

3. A connectivity verification framework claimed in claim 1, wherein the connectivity verification jobs are scheduled and the connectivity verification server performs scheduled connectivity verification.

4. A connectivity verification framework claimed in claim 1, wherein the connectivity verification application further providing a display of connectivity verification results.

5. A connectivity verification framework claimed in claim 1, wherein the results of each connectivity verification job may be compared against a connectivity profile, a deviation from the connectivity profile being used to raise an alarm.

6. A connectivity verification framework claimed in claim 4, wherein the connectivity verification results, including alarm information, are further used to generate a network map displaying selected connectivity verification results.

7. A method of creating a network connectivity verification test, comprising steps of:

   a. defining a connectivity verification job;

   b. configuring a connectivity verification server to perform the connectivity verification job; and

c. displaying connectivity verification results.

8. The method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises steps of:

   a. selecting via an NMS GUI, a pair of source and destination IP objects between which connectivity is to be verified; and

   b. specifying a connectivity verification schedule;

9. The method of creating a network connectivity verification test claimed in claim 7, wherein defining the connectivity verification job further comprises steps of:

   a. specifying connectivity verification thresholds to be applied against connectivity verification results.

10. The method of creating a network connectivity verification test claimed in claim 8, wherein specifying connectivity thresholds further comprises specifying a threshold for a round trip delay, jitter, and packet loss.

11. The method of creating a network connectivity verification test claimed in claim 7, wherein a selected IP object include one of a router, IP interface, and IP address

12. The method of creating a network connectivity verification test claimed in claim 7, wherein the pair of IP objects is selected selecting one of an IP link, an LSP, and a VPN.

13. The method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises a step of: configuring a connectivity verification parameter including one of a number of ping commands to issue, a ping packet size, ping data fill pattern, a time to wait for response, and a type of service.

14. The method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises a step of: configuring a connectivity verification parameter including one of a number of traceroute commands to issue, a traceroute packet size, traceroute packet data fill pattern, a time to wait for response, and a type of service.

15. A method of performing a network connectivity verification in a network management context comprising steps of:

    a. performing scheduled connectivity verification;

    b. comparing a connectivity verification result with a threshold; and

    c. raising an alarm if the connectivity verification result has reached the threshold.

16. The method of performing a network connectivity verification claimed in claim 15, further comprising a step of: storing connectivity verification job on computer readable medium for subsequent access and execution.

17. The method of performing a network connectivity verification claimed in claim 15, further comprising a step of: highlighting at least one IP object based on one of a connectivity verification job and a connectivity verification result.

18. The method of performing a network connectivity verification claimed in claim 17, wherein a highlighted object is one of an OSI Layer 2 and OSI Layer 3 object.

19. The method of performing a network connectivity verification claimed in claim 15, wherein performing scheduled connectivity verification the method further comprising a step of: periodically executing connectivity verification tests.

20. The method of performing a network connectivity verification claimed in claim 15, wherein performing scheduled connectivity verification the method further comprising a step of: issuing a one of a ping command and traceroute command.

21. The method of performing a network connectivity verification claimed in claim 15, further comprising a step of: storing historical connectivity verification results on computer readable medium for subsequent access.

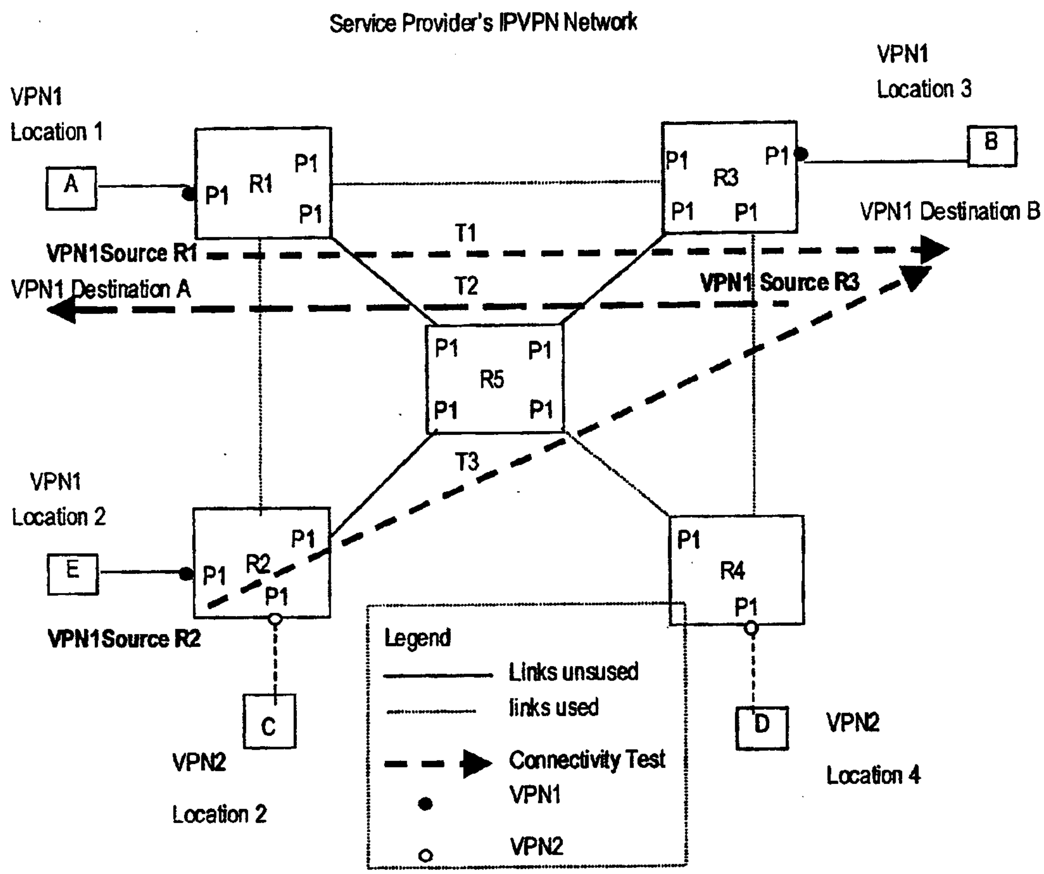


Figure 1 Prior Art

Marks & Clerk

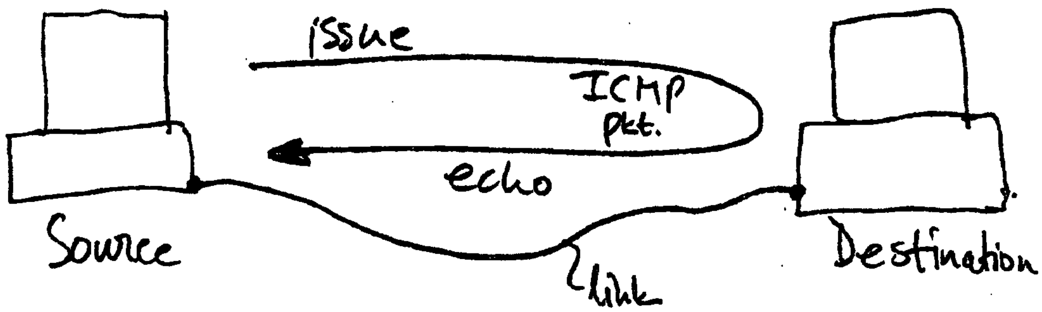


FiG 2.

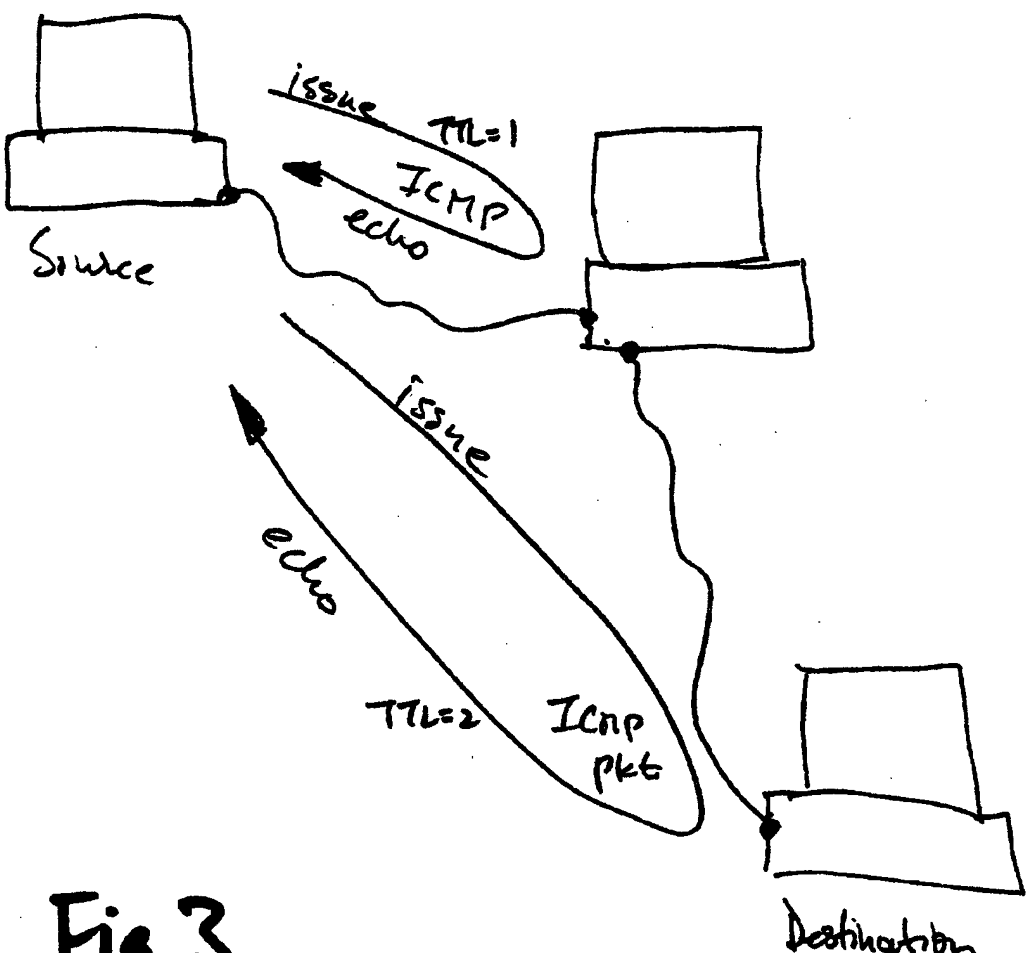


Fig 3

Marks & Clerk

CA 02425442 2003-04-15

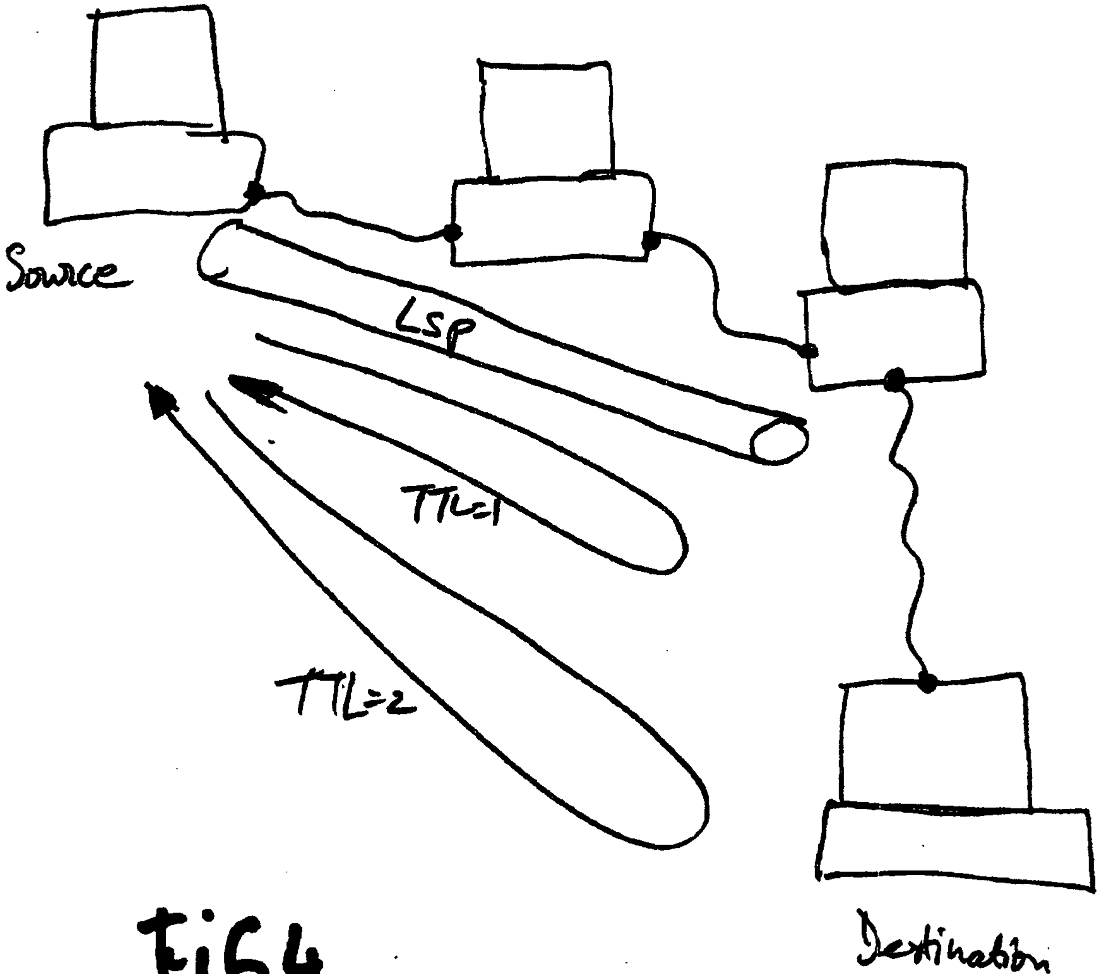


FIG 4.

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CA 02425442 2003-04-15

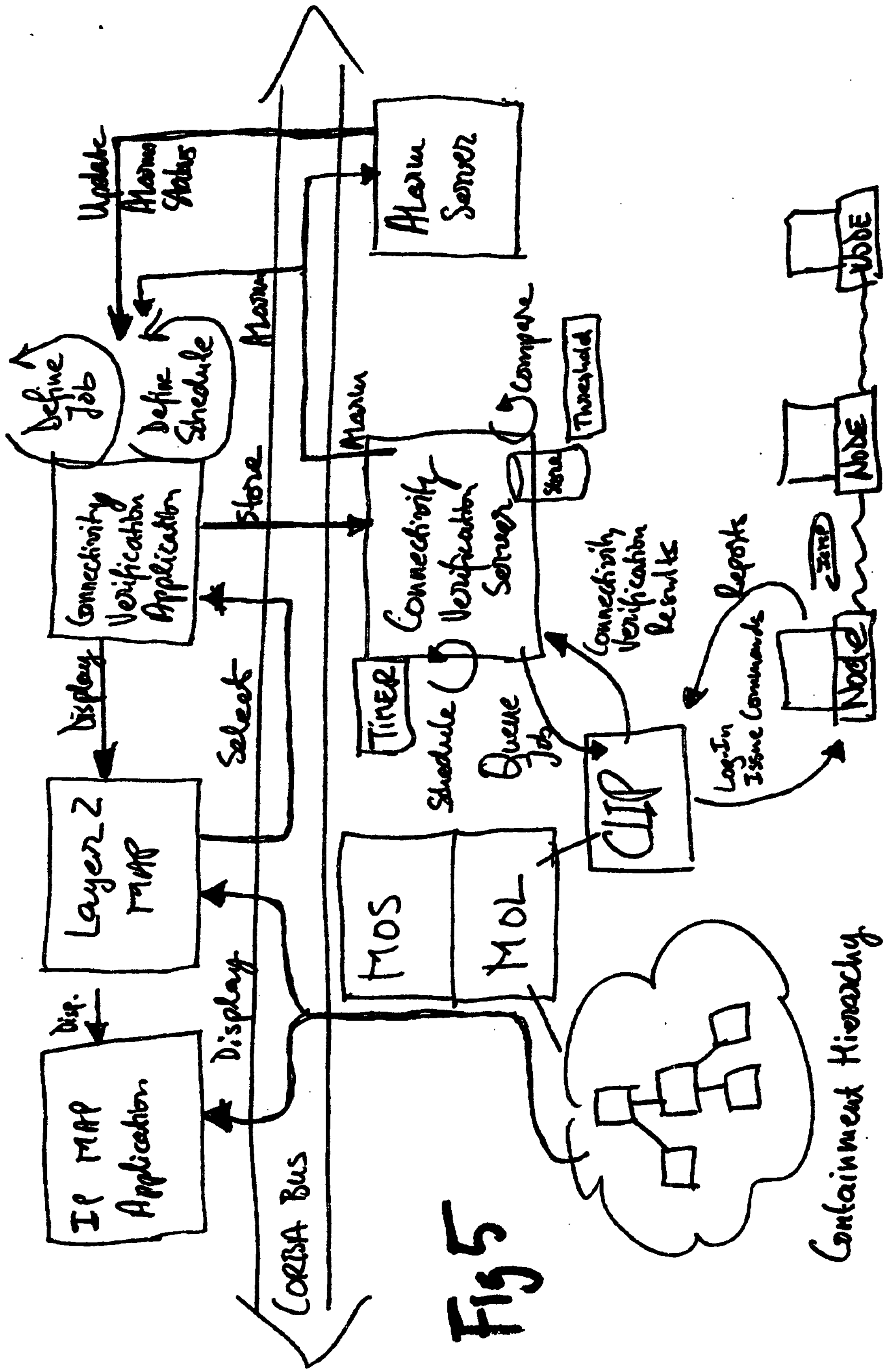

Fig 5

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CA 02425442 2003-04-15

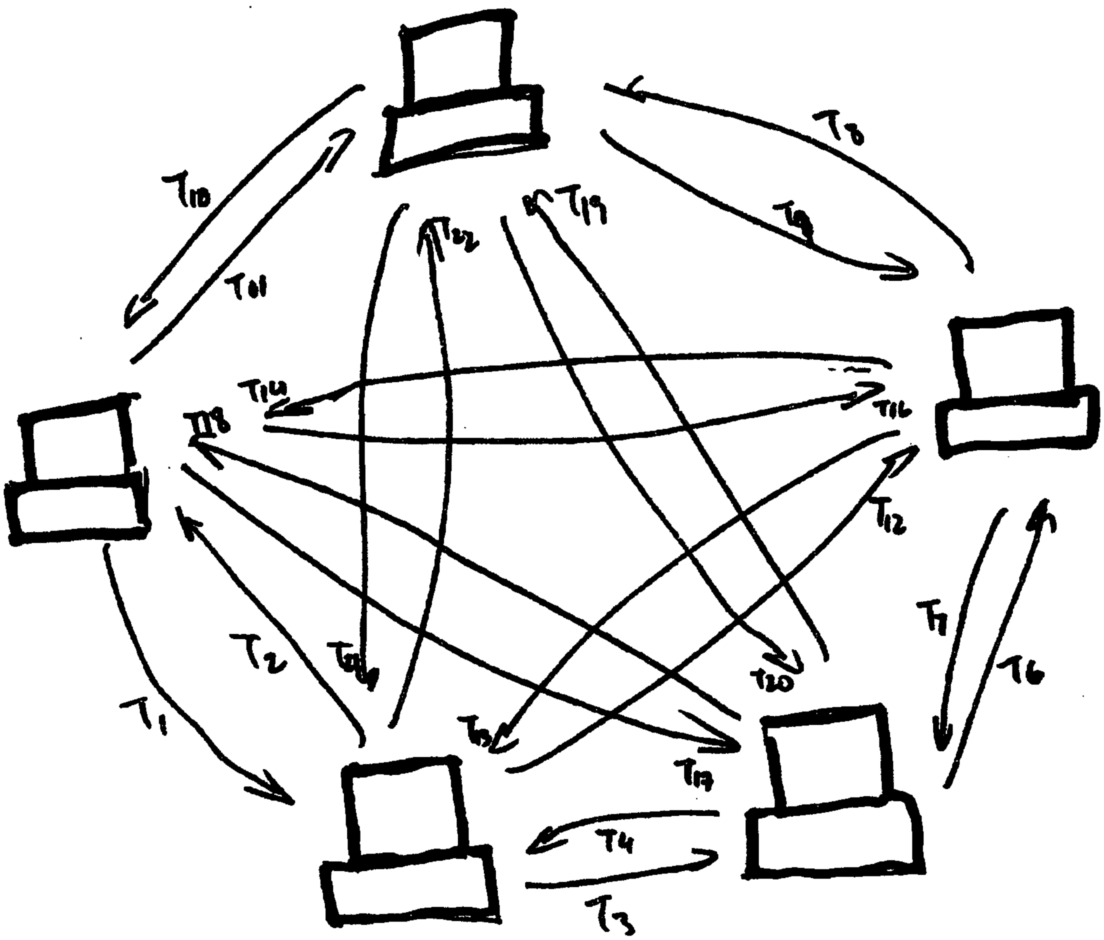

Fig 6.

Marks & Clerk

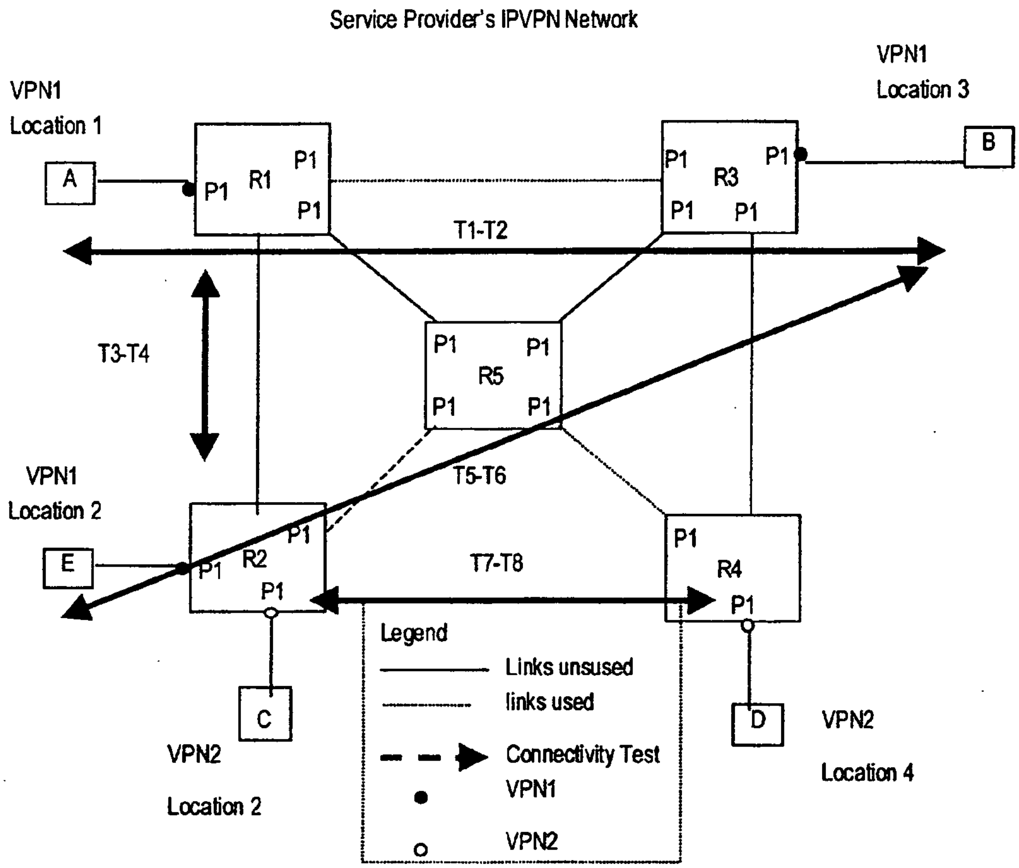

Figure 7 VPN Connectivity Test

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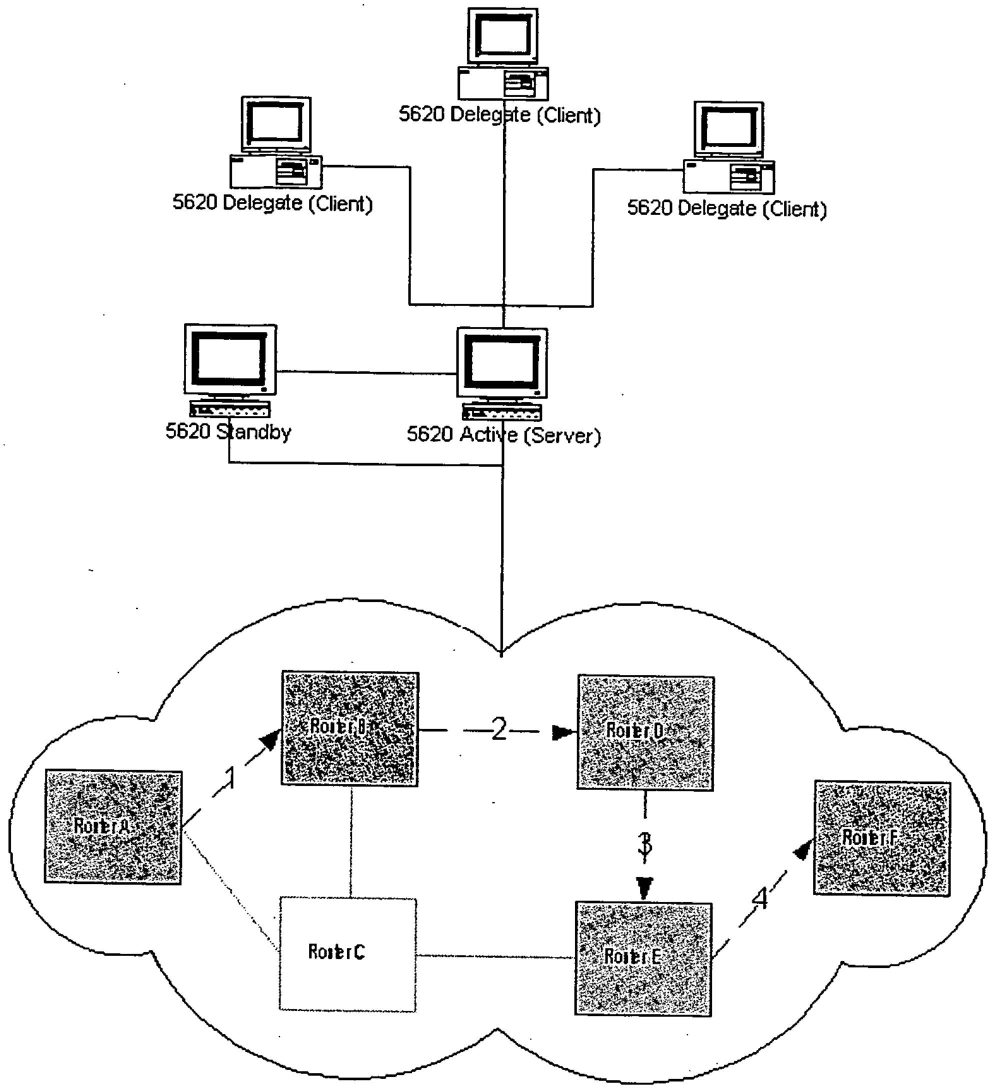

Figure 0-1: IP Maintenance and Diagnostics Operation System View

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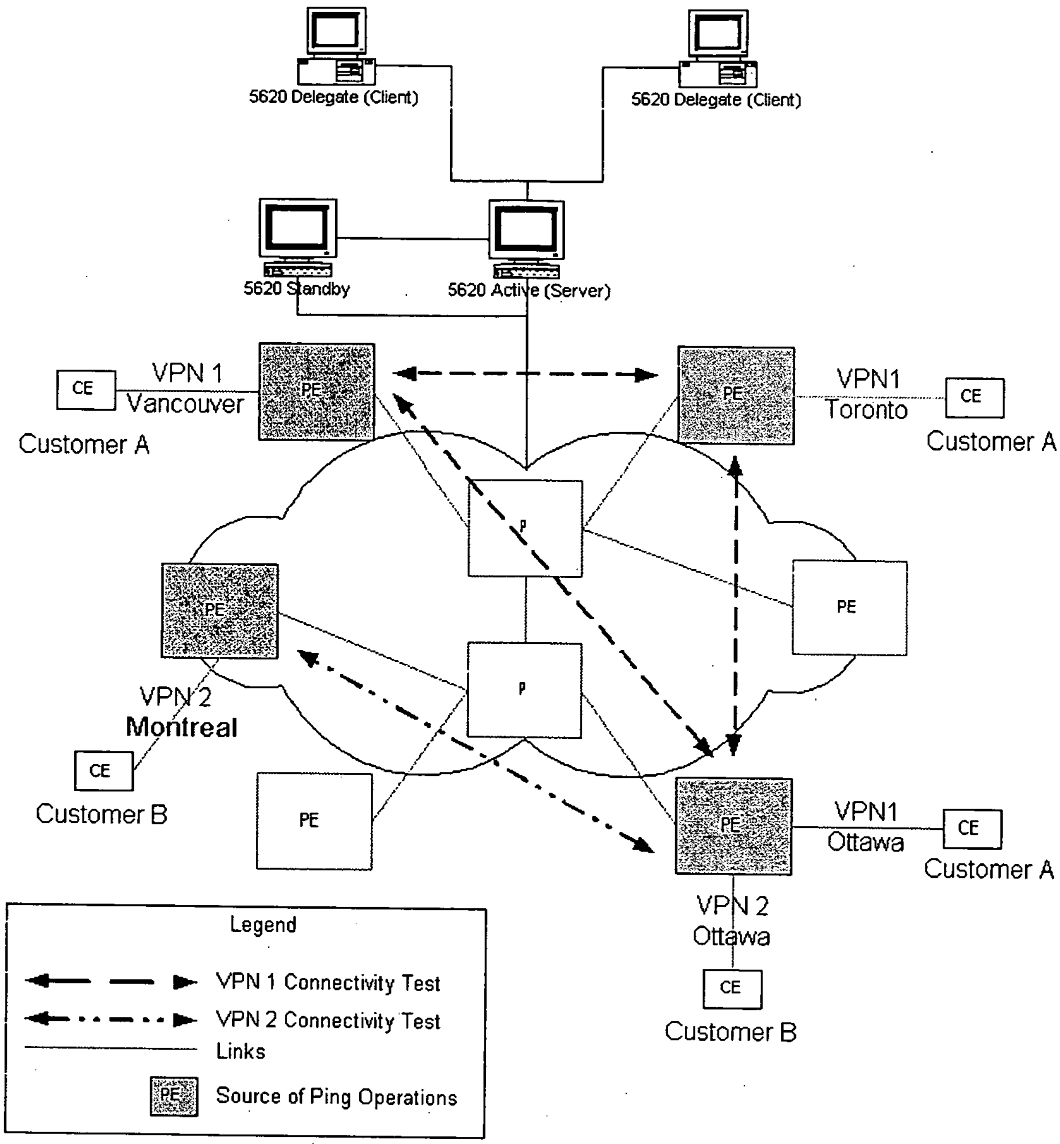

Figure 0-2: IP Maintenance and Diagnostics Scheduling System View

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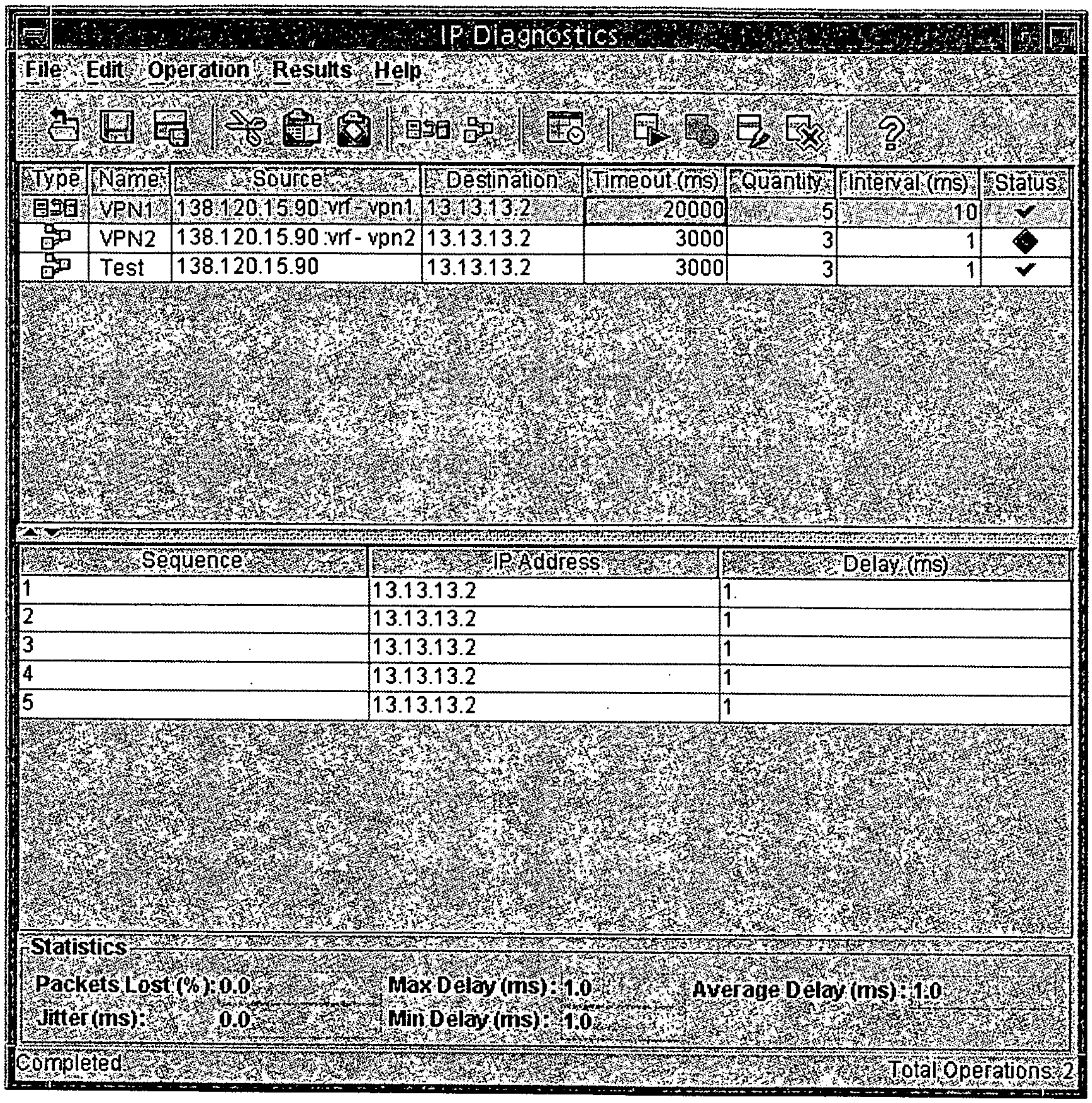

Figure 0-3: IP Maintenance and Diagnostics Operation Window

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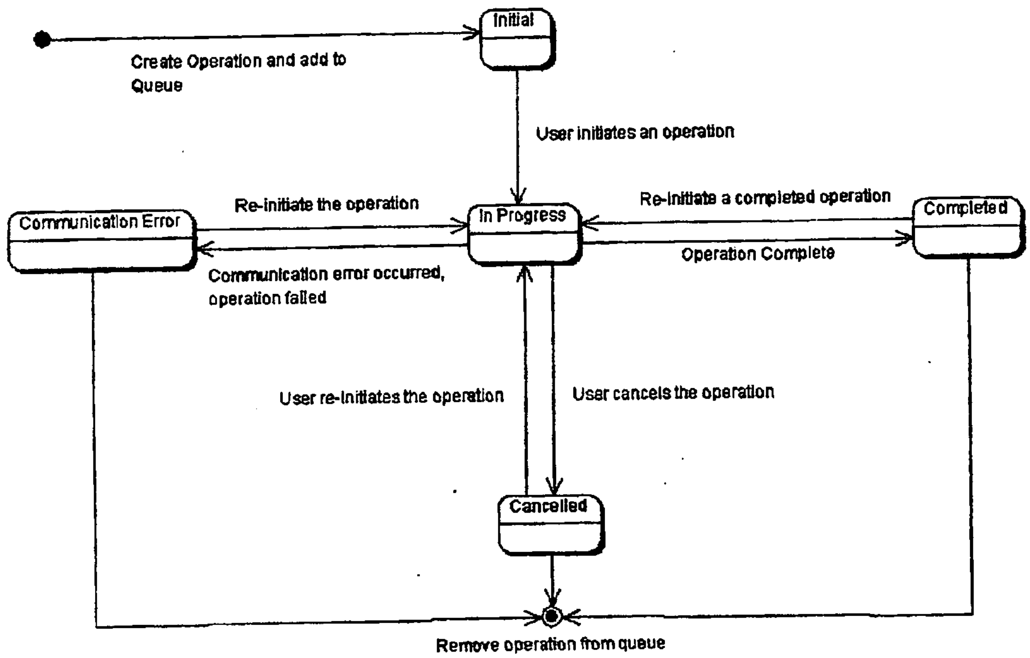

Figure 0-4: Operation Status State Diagram

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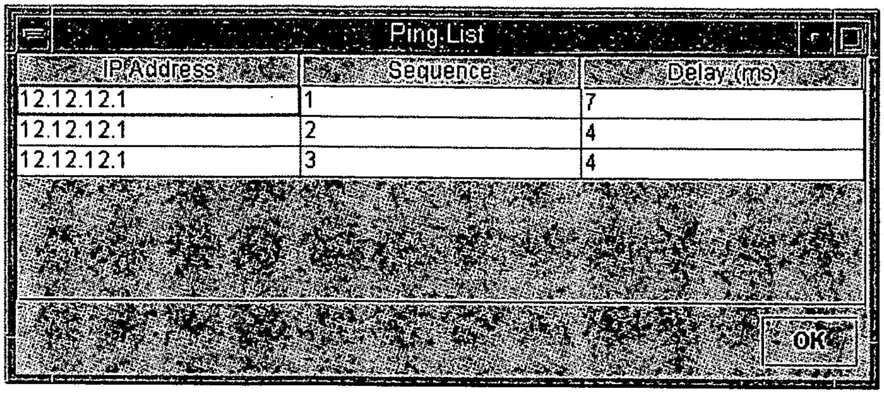

Figure 0-5: Ping List Window

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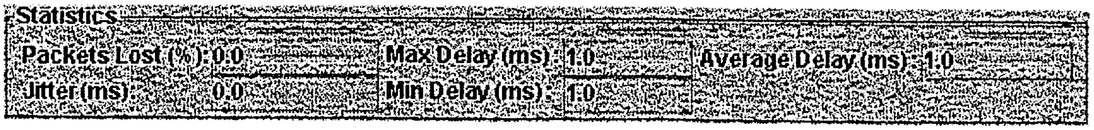

Figure 0-6: Operation Statistics

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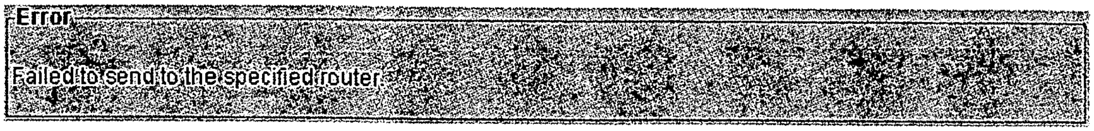

Figure 0-7: Execution Error

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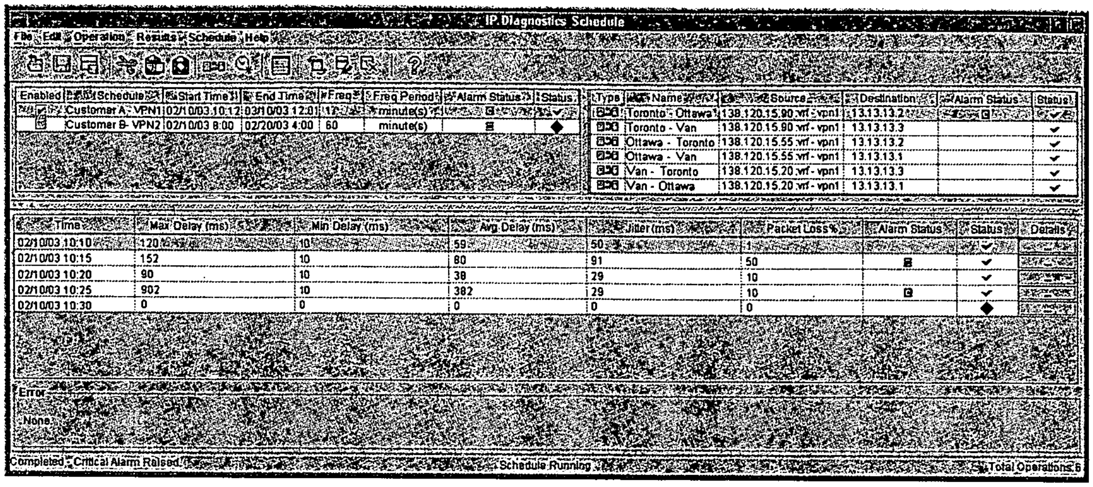

Figure 0-8: IP Maintenance and Diagnostics Scheduling Window

Marks & Clerk

Ping List

Time	IP Address	Sequence	Delay (ms)
02/20/03 4:00	12.12.12.1	1	7
	12.12.12.1	2	4
	12.12.12.1	3	Node Unreachable
02/20/03 4:10	12.12.12.1	1	7
	12.12.12.1	2	4
	12.12.12.1	3	4

OK

Figure 0-9: Summary Ping List Window

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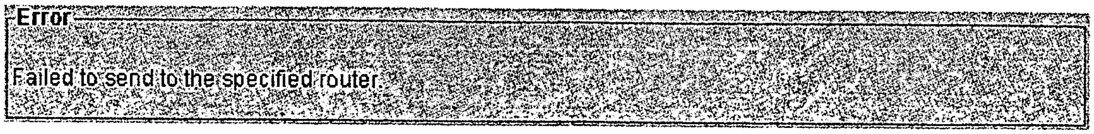

Figure 0-10: Execution Error

Marks & Clerk

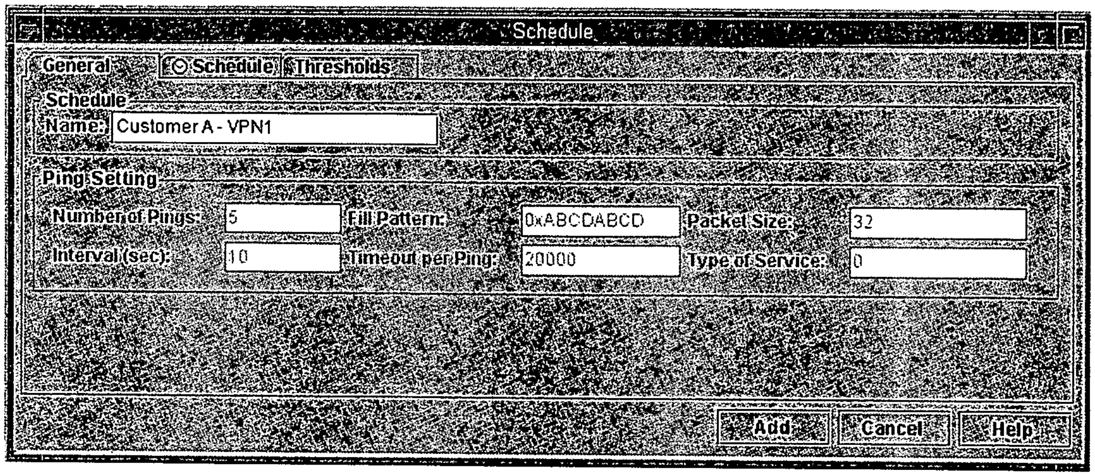

Figure 0-11: Scheduling Configuration Window - General Tab

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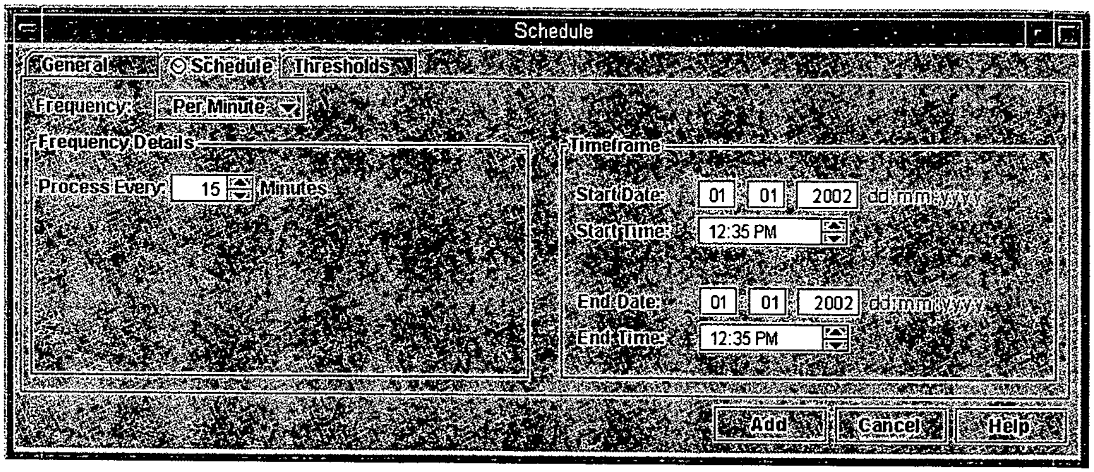

Figure 0-12: Scheduling Configuration Window - Schedule Tab

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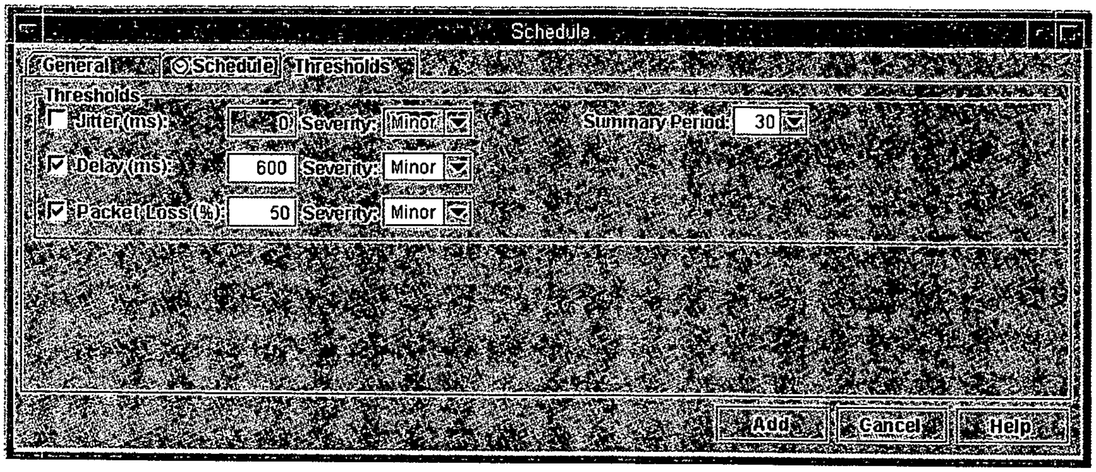

Figure 0-13: Scheduling Configuration Window - Threshold Tab

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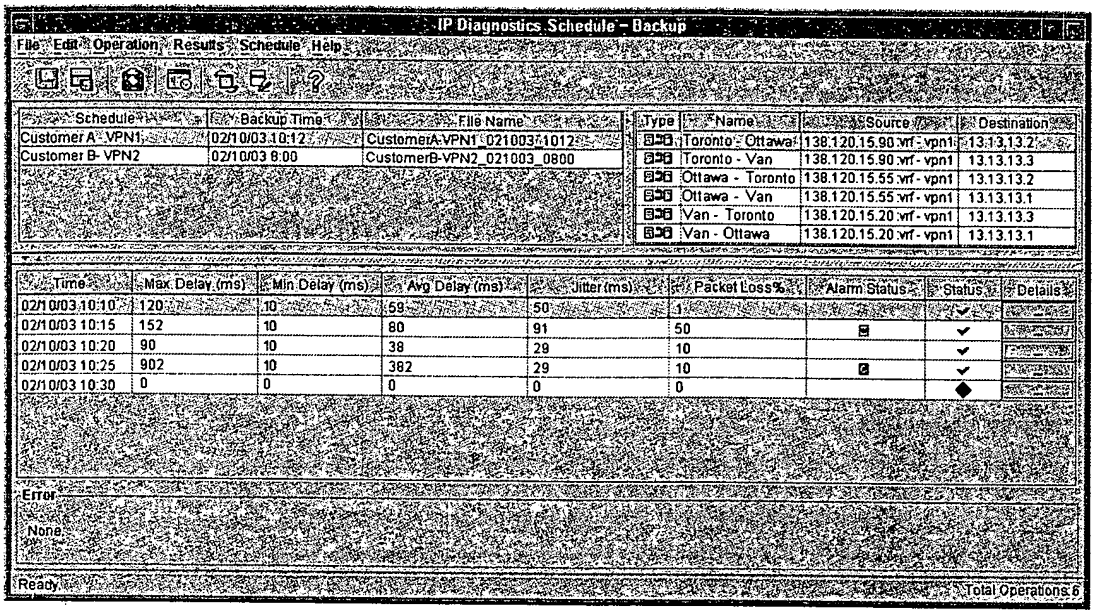

Figure 0-14: IP Maintenance and Diagnostics Schedule Backup Window

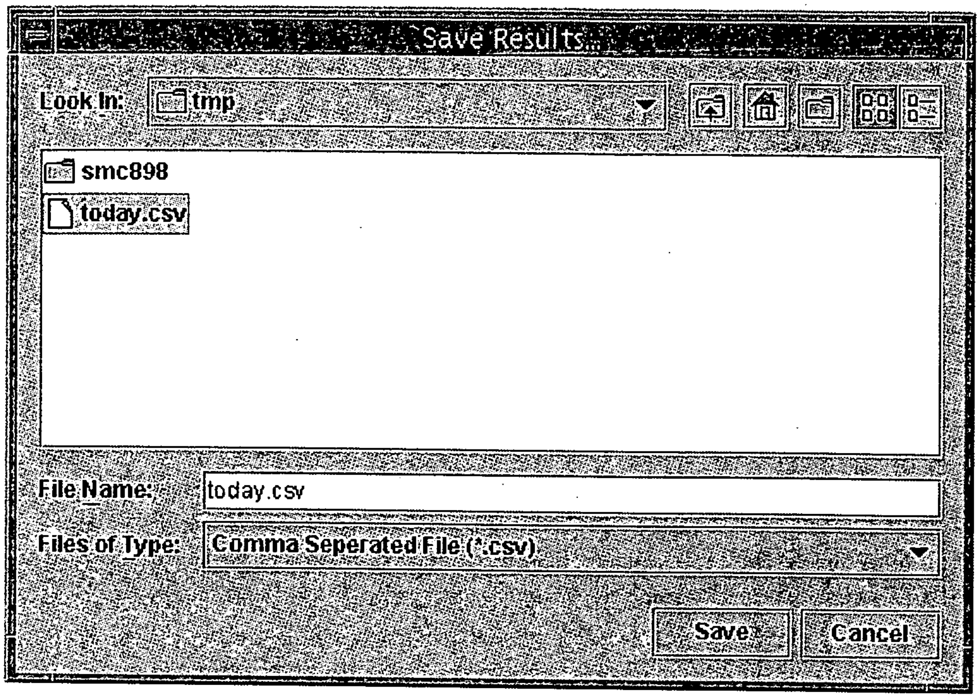

Figure 0-15: Save Results Dialog

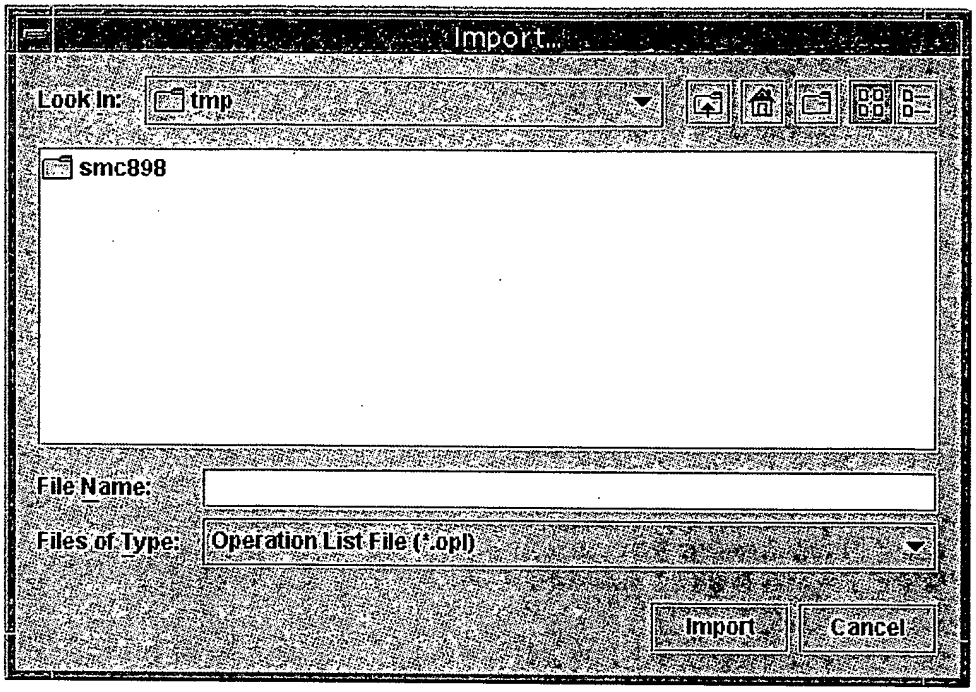

Figure 0-16: Open Operations an Operation List Dialog

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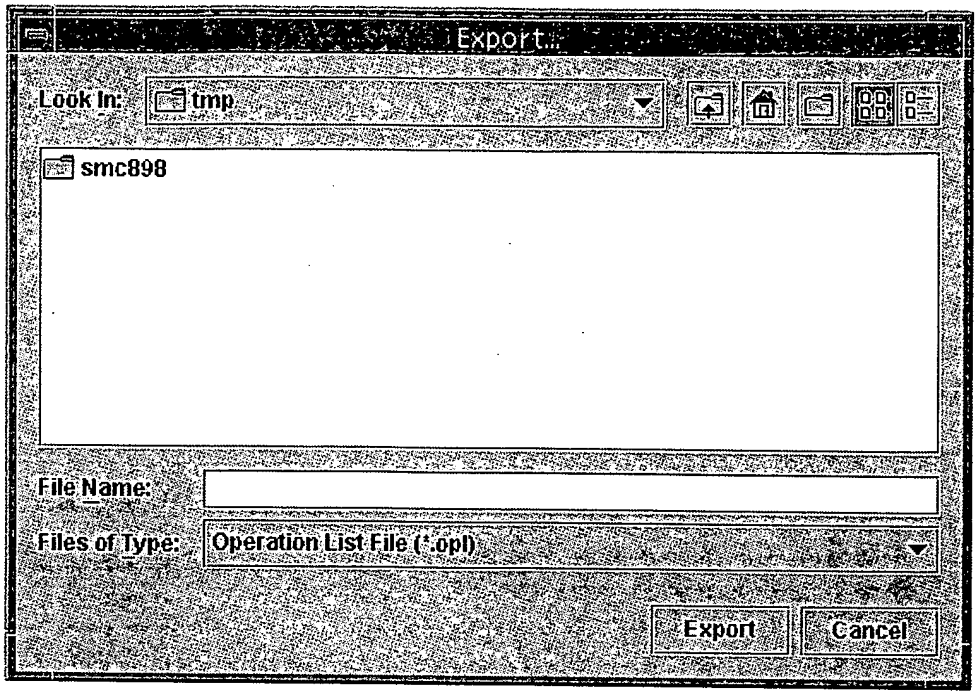

Figure 0-17: Save an Operation List Dialog

Marin & Clerk

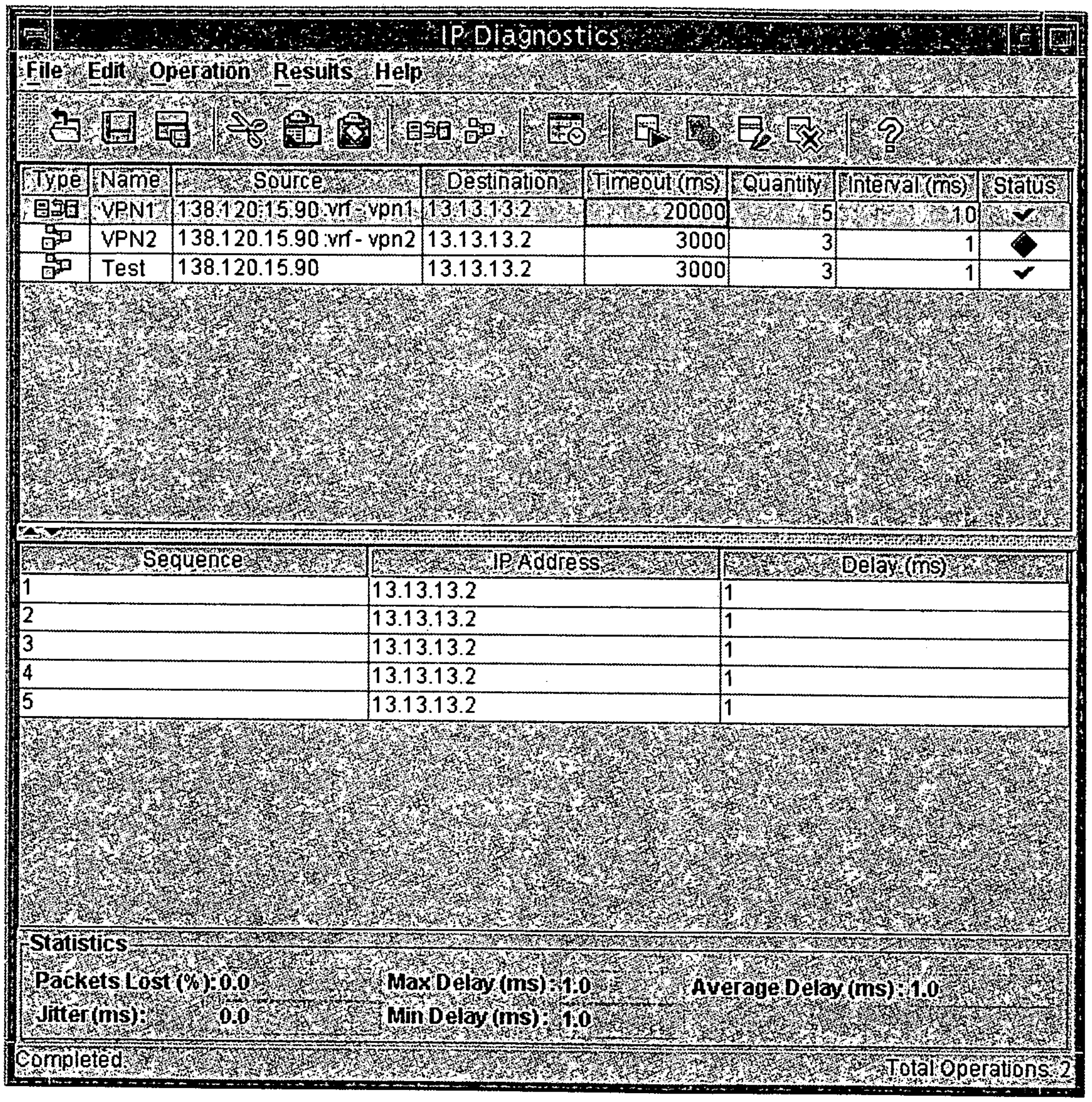

Figure 0-18: Ping Operation in the Operation List

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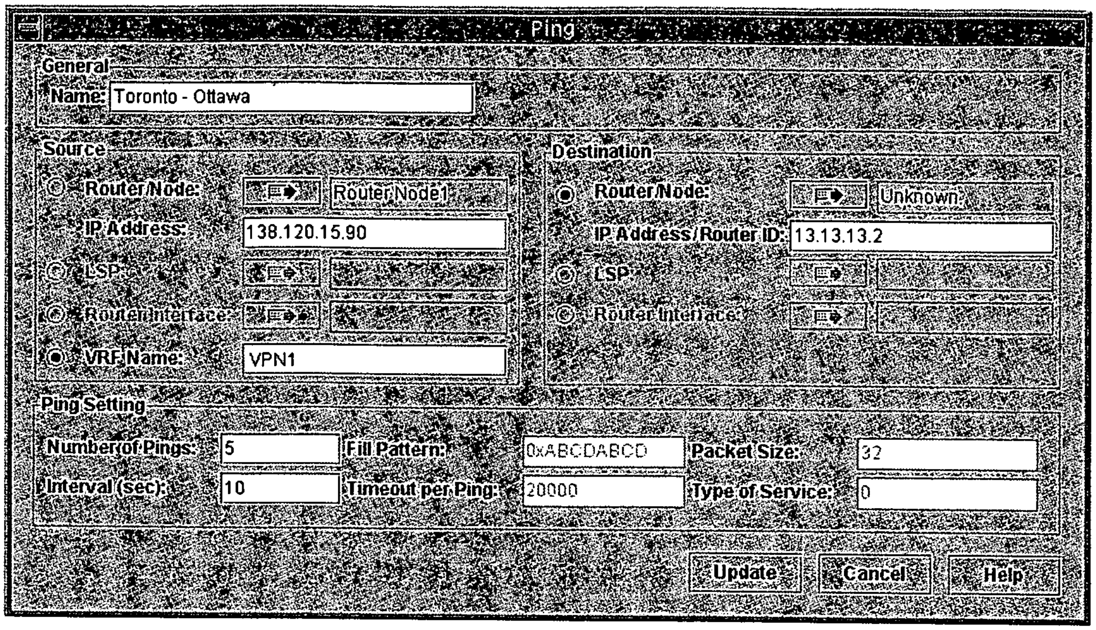

Figure 0-19: Ping Window

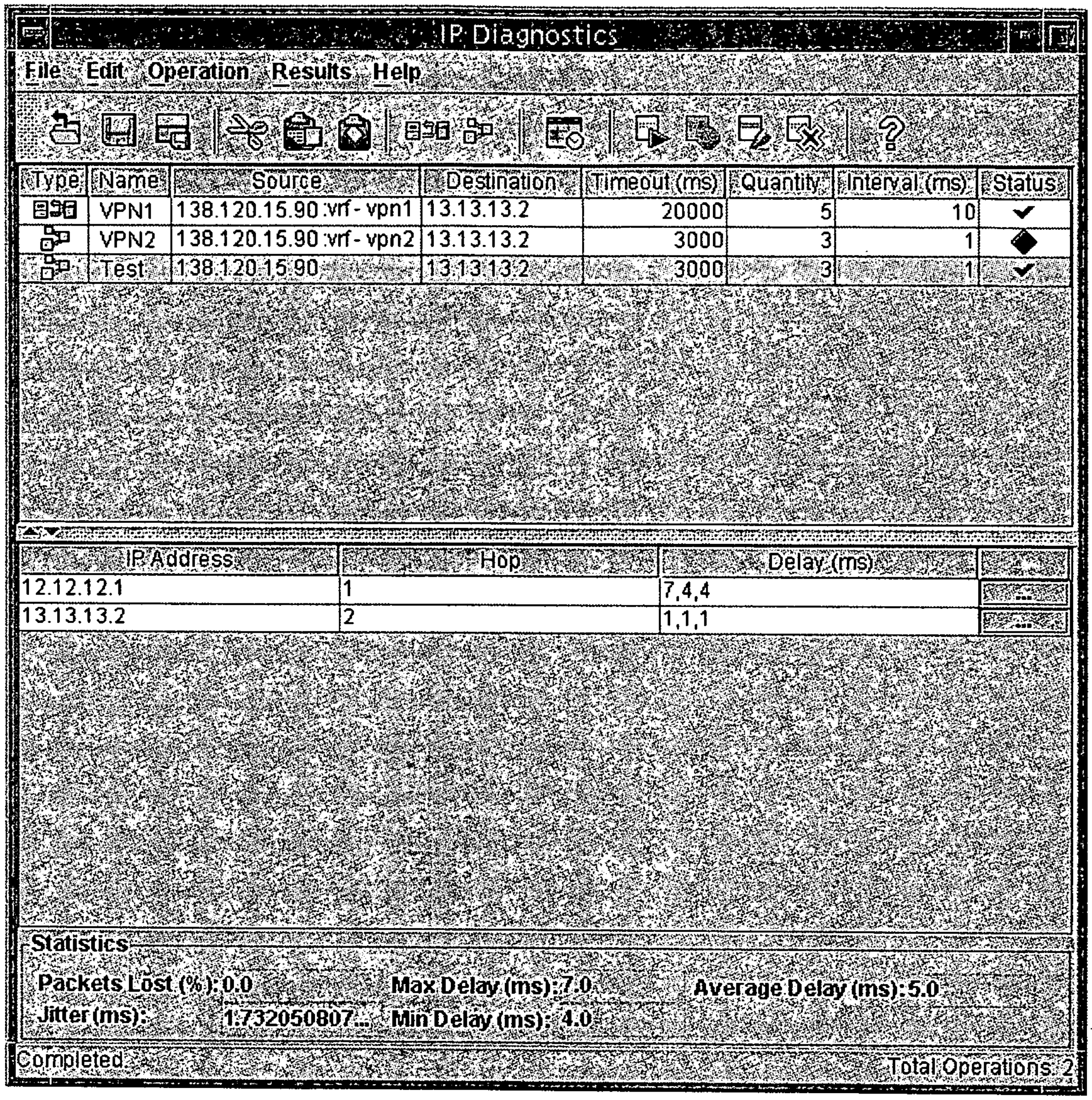

Figure 0-20: Traceroute Operation in the Operation List

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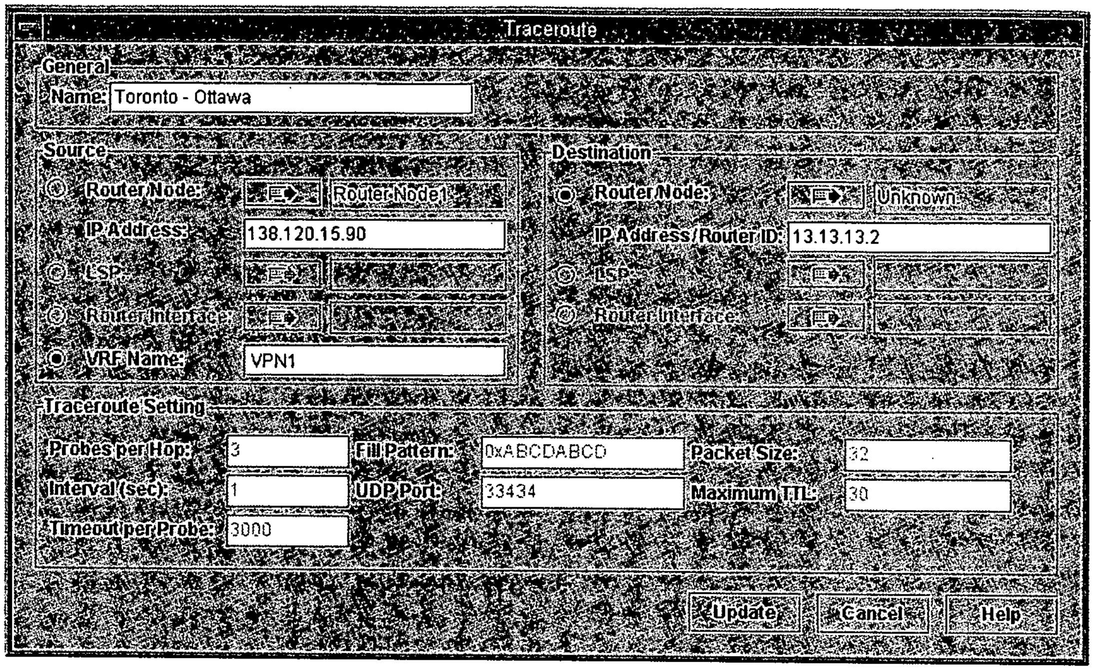

Figure 0-21: Traceroute Window

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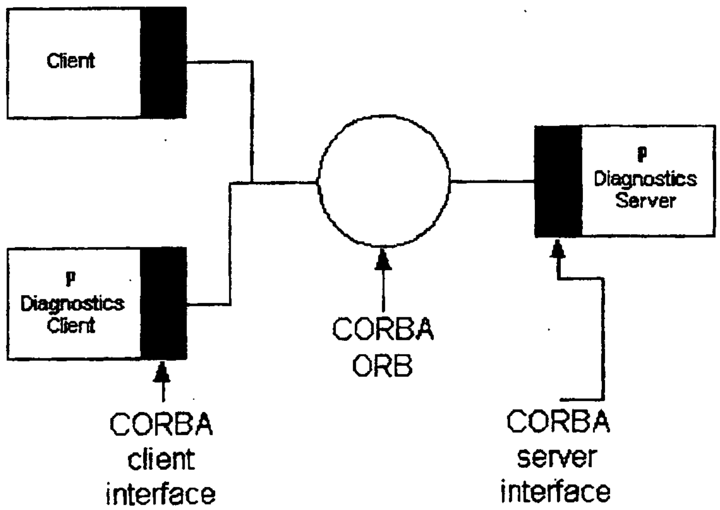

Figure 0-22: CORBA Interface

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EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	connect$5 near1 verification near1 jobs	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:34
L2	118	(connect$5 near1 verification) same server	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:39
L3	2	2 same framework	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:36
L4	5	2 same alarm$5	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:36
L5	8	2 same (alarm$5 or alert$5 or notif$7)	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:39
L6	227	(connect$5 near2 verification) same server	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:45
L7	14	6 same (alarm$5 or alert$5 or notif$7)	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:47
L8	8	7 and (@ad<"20030415" or @rlad<"20030415")	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:48
L9	5013	(connect$5 near2 (verif$7 or test$5 or confirm$5 or monitor$5)) same server	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:46
L10	465	9 same (alarm$5 or alert$5 or notif$7)	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:48
L11	10	10 same VPN	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:48
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L14	2852	709/220.ccls.	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:54
L15	6591	709/224.ccls.	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:54

EAST Search History

L16	6430	709/223.ccls.	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:54
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L18	8	10 and 14	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:56
L19	56	10 and 15	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:56
L20	24	10 and 16	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:56
L21	150	10 and 17	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:56
L22	7	18 and (@ad<"20030415" or @rlad<"20030415")	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:56
L23	48	19 and (@ad<"20030415" or @rlad<"20030415")	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:56
L24	20	20 and (@ad<"20030415" or @rlad<"20030415")	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:56
L25	117	21 and (@ad<"20030415" or @rlad<"20030415")	US-PGPUB; USPAT; EPO	OR	ON	2007/09/16 19:56

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,111	04/08/2004	Denis Armand Proulx	ALC 3125	8431

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Office Action Summary	Application No. 10/820,111	Applicant(s) PROULX ET AL.
	Examiner Philip B. Tran	Art Unit 2155

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 November 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/8/2004*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 7 is objected to because of the following informalities:

In claim 7, the end of second limitation should have a period punctuation mark.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-3, 5-7 and 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koritzinsky, U.S. Pat. No. 6,494,831 in view of Wood, U.S. Pat. No. 6,405,248.

Regarding claim 1, Koritzinsky teaches a network management connectivity verification framework comprising a connectivity verification server performing unattended connectivity verification jobs and a connectivity verification application for defining connectivity verification jobs, configuring the connectivity verification server accordingly (= verifying network connectivity between a diagnostic system and a remote service facility) [see Abstract and Figs. 1-5 and Col. 12, Lines 13-29].

Koritzinsky does not explicitly teach displaying configuration verification results. However, Wood, in the same field of monitoring network nodes connectivity endeavor,

discloses collecting connectivity information and displaying the network topology information [see Wood, Abstract and Col. 1, Line 61 to Col. 2, Line 9]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Wood into the teaching of Koritzinsky in order to efficiently keep track of network connectivity information and quickly identify alerting condition for network management purpose.

Regarding claim 2, Koritzinsky further teaches a connectivity verification framework claimed in claim 1, wherein the connectivity verification jobs are scheduled and the connectivity verification server performs scheduled connectivity verification [see Col. 2, Line 49 to Col. 3, Line 10 and Col. 6, Lines 50-65 and Col. 8, Lines 31-43].

Regarding claim 3, Koritzinsky does not explicitly teach a connectivity verification framework claimed in claim 1, wherein the connectivity verification application further providing a display of connectivity verification results. However, Wood, in the same field of monitoring network nodes connectivity endeavor, discloses collecting connectivity information and displaying the network topology information [see Wood, Abstract and Col. 1, Line 61 to Col. 2, Line 9]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Wood into the teaching of Koritzinsky for the same reason set forth above to claim 1.

Regarding claim 5, Koritzinsky further teaches alarm information [see Abstract and Col. 6, Line 66 to Col. 7, Line 34 and Col. 7, Line 62 to Col. 8, Line 30]. Koritzinsky does not explicitly teach a connectivity verification framework claimed in claim 3, wherein the connectivity verification results are further used to generate a network map displaying selected connectivity verification results. However, Wood, in the same field of monitoring network nodes connectivity endeavor, discloses collecting connectivity information and displaying the network topology information [see Wood, Abstract and Col. 1, Line 61 to Col. 2, Line 9]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Wood into the teaching of Koritzinsky for the same reason set forth above to claim 1.

Claim 6 is rejected under the same rationale set forth above to claim 1.

Regarding claim 7, Koritzinsky further teaches the method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprising selecting via an NMS user interface and specifying a connectivity verification schedule [see Col. 2, Line 49 to Col. 3, Line 10 and Col. 6, Lines 50-65 and Col. 8, Lines 31-43], and verifying the network address location of system [see Col. 4, Lines 1-8]. Koritzinsky does not explicitly teach a pair of source and destination IP objects between which connectivity is to be verified. However, Wood, in the same field of monitoring network nodes connectivity endeavor, discloses collecting connectivity information and displaying the network topology information including

address table information [see Wood, Abstract and Col. 1, Line 61 to Col. 2, Line 9 and Col. 2, Lines 12-60]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Wood into the teaching of Koritzinsky for the same reason set forth above to claim 1.

Regarding claim 10, Koritzinsky further teaches the method of creating a network connectivity verification test claimed in claim 7, wherein a selected IP object include one of a router, IP interface, and IP address [see Col. 6, Lines 13-34 and Col. 11, Lines 8-40].

Regarding claim 11, Koritzinsky further teaches the method of creating a network connectivity verification test claimed in claim 7, wherein the pair of IP objects is selected selecting one of an IP link, an LSP, and a VPN [see Col. 6, Lines 13-34].

4. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Koritzinsky, U.S. Pat. No. 6,494,831 in view of Wood, U.S. Pat. No. 6,405,248 and further in view of Boodaghians, U.S. Pat. No. 6,965,572.

Regarding claim 4, Koritzinsky further teaches a connectivity verification framework claimed in claim 1, wherein the results of each connectivity verification job is stored in a log and there exists an alert module for generating alerts in response to problems with connectivity [see Col. 6, Line 66 to Col. 7, Line 34 and Col. 7, Line 62 to Col. 8, Line 30]. Koritzinsky does not explicitly teach the results of each connectivity

verification job may be compared against a connectivity profile, a deviation from the connectivity profile being used to raise an alarm.

However, Boodaghians, in the same field of connectivity verification test endeavor, discloses determining parameters such as connectivity, delay and other QoS parameters by comparing a delay threshold with a predetermined standard and alarms can be activated if one or more tested parameters fail [see Boodaghians, Col. 8, Lines 4-56]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Boodaghians into the teaching of Koritzinsky and Wood in order to efficiently identify specific connectivity problems for network management purpose so that the problems can be quickly resolved.

5. Claims 8-9 and 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koritzinsky, U.S. Pat. No. 6,494,831 in view of Wood, U.S. Pat. No. 6,405,248 and further in view of admitted prior art (APA) [the background of instant application's specification].

Regarding claims 8-9, Koritzinsky and Wood do not explicitly teach the method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises a step of specifying connectivity verification thresholds to be applied against connectivity verification results, wherein specifying connectivity thresholds further comprises specifying a threshold for a round trip delay, jitter, and packet loss. However, the admitted prior art (APA) in the background of the instant application's specification discloses determining transport

delay and jitter profiles for each transport path between a pair of network nodes in a communications network [see APA, Paragraphs 0014 & 0018]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of APA into the teaching of Koritzinsky and Wood in order to quickly identify specific connectivity problems for network management purpose.

Regarding claims 12-13, Koritzinsky and Wood do not explicitly teach the method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises a step of: configuring a connectivity verification parameter including one of a number of ping commands to issue, a ping packet size, ping data fill pattern, a time to wait for response, and a type of service and configuring a connectivity verification parameter including one of a number of traceroute commands to issue, a traceroute packet size, traceroute packet data fill pattern, a time to wait for response, and a type of service.

However, the admitted prior art (APA) in the background of the instant application's specification discloses verifying connectivity between individual routers including pining/tracerout test [see APA, Paragraphs 0014 & 0021-0022]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of APA into the teaching of Koritzinsky and Wood in order to quickly identify specific connectivity problems for network management purpose.

6. Claims 14-18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koritzinsky, U.S. Pat. No. 6,494,831 in view of Boodaghians, U.S. Pat. No. 6,965,572.

Regarding claim 14, Koritzinsky teaches a method of performing a network connectivity verification in a network management context comprising steps of performing scheduled connectivity verification (= verifying network connectivity between a diagnostic system and a remote service facility) [see Abstract and Figs. 1-5 and Col. 12, Lines 13-29] and generating alerts in response to problems with connectivity [see Col. 6, Line 66 to Col. 7, Line 34 and Col. 7, Line 62 to Col. 8, Line 30]. Koritzinsky does not explicitly teach comparing a connectivity verification result with a threshold and raising an alarm if the connectivity verification result has reached the threshold.

However, Boodaghians, in the same field of connectivity verification test endeavor, discloses determining parameters such as connectivity, delay and other QoS parameters by comparing a delay threshold with a predetermined standard and alarms can be activated if one or more tested parameters fail [see Boodaghians, Col. 8, Lines 4-56]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Boodaghians into the teaching of Koritzinsky and Wood in order to efficiently identify specific connectivity problems for network management purpose so that the problems can be quickly resolved.

Regarding claim 15, Koritzinsky further teaches the method of performing a network connectivity verification claimed in claim 14, further comprising a step of: storing connectivity verification job on computer readable medium for subsequent access and execution [see Col. 6, Line 66 to Col. 7, Line 34 and Col. 7, Line 62 to Col. 8, Line 30].

Regarding claims 16-17, Koritzinsky further teaches the method of performing a network connectivity verification claimed in claim 14, further comprising a step of: highlighting at least one IP object based on one of a connectivity verification job and a connectivity verification result and wherein a highlighted object is one of an OSI Layer 2 and OSI Layer 3 object [see Col. 6, Lines 13-34 and Col. 11, Lines 8-40].

Regarding claim 18, Koritzinsky further teaches the method of performing a network connectivity verification claimed in claim 14, wherein performing scheduled connectivity verification the method further comprising a step of: periodically executing connectivity verification tests [see Col. 12, Lines 13-31].

Regarding claim 20, Koritzinsky further teaches the method of performing a network connectivity verification claimed in claim 14, further comprising a step of: storing historical connectivity verification results on computer readable medium for

subsequent access [see Col. 6, Line 66 to Col. 7, Line 34 and Col. 7, Line 62 to Col. 8, Line 30].

7. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Koritzinsky, U.S. Pat. No. 6,494,831 in view of Boodaghians, U.S. Pat. No. 6,965,572 and further in view of admitted prior art (APA) [the background of instant application's specification].

Regarding claim 19, Koritzinsky and Boodaghians do not explicitly teach the method of performing a network connectivity verification claimed in claim 14, wherein performing scheduled connectivity verification the method further comprising a step of: issuing a one of a ping command and traceroute command.

However, the admitted prior art (APA) in the background of the instant application's specification discloses verifying connectivity between individual routers including pining/tracerout test [see APA, Paragraphs 0014 & 0021-0022]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of APA into the teaching of Koritzinsky and Wood in order to quickly identify specific connectivity problems for network management purpose.

Other References Cited

8. The following references cited by the examiner but not relied upon are considered pertinent to applicant's disclosure.

A) Mauger et al, U.S. Pat. No. 6,298,043.

B) Miesbauer et al, U.S. Pat. No. 6,760,767.

C) Hirst et al, U.S. Pat. No. 6,581,166.

D) Ludovici et al, U.S. Pat. No. 6,636,898.

E) Langfahl, Jr., U.S. Pat. No. 6,031,528.

F) Azieres et al, U.S. Pat. No. 6,646,564.

G) Pekary et al, U.S. Pat. No. 7,124,183.

H) Searl et al U.S. Pat. Application Pub. No. US 2004/0162781 A1.

9. A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS ACTION IS SET TO EXPIRE THREE MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION. FAILURE TO RESPOND WITHIN THE PERIOD FOR RESPONSE WILL CAUSE THE APPLICATION TO BECOME ABANDONED (35 U.S.C. § 133). EXTENSIONS OF TIME MAY BE OBTAINED UNDER THE PROVISIONS OF 37 CAR 1.136(A).

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Philip Tran whose telephone number is (571) 272-3991. The Group fax phone number is (571) 273-8300. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Saleh Najjar, can be reached on (571) 272-4006.

11. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Philip Tran
PHILIP TRAN
PRIMARY EXAMINER
Art Unit 2155
Sept 11, 2007

PTO/SB/08A (04-03)
Approved for use through 04/30/2003. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Substitute for form 1449/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	~~New~~ 10/820,111
Filing Date	April 8, 2004
First Named Inventor	Denis Armand Proulx
Art Unit	~~Unassigned~~ 2155
Examiner Name	~~Uassigned~~ P. TRAN
Attorney Docket Number	ALC 3125

U. S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Document Number Number-Kind Code[2] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
PBT	1	US- 5,974,237	10/26/1999	Shurmer	
	2	US- 6,205,122	03/20/2001	Sharon	
	3	US- 6,222,827	04/24/2001	Grant	
	4	US- 6,397,248	05/28/2002	Iyer	
	5	US- 6,405,248	06/11/2002	Wood	
PBT	6	US- 6,502,130	12/31/2002	Keeler, Jr.	
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document Country Code[3] -Number[4] -Kind Code[5] (if known)	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages Or Relevant Figures Appear	T[6]

Examiner Signature	Philip Tran	Date Considered	9/11/2007

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant. [1] Applicant's unique citation designation number (optional). [2] See Kinds Codes of USPTO Patent Documents at www.uspto.gov or MPEP 901.04. [3] Enter Office that issued the document, by the two-letter code (WIPO Standard ST.3). [4] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [5] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST. 16 if possible. [6] Applicant is to place a check mark here if English language Translation is attached.

Notice of References Cited	Application/Control No. 10/820,111	Applicant(s)/Patent Under Reexamination PROULX ET AL.	
	Examiner Philip B. Tran	Art Unit 2155	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-6,494,831	12-2002	Koritzinsky, Ianne Mae Howards	600/301
*	B	US-6,405,248	06-2002	Wood, Michael	709/223
*	C	US-6,965,572	11-2005	Boodaghians, Samson	370/249
*	D	US-6,298,043	10-2001	Mauger et al.	370/248
*	E	US-6,760,767	07-2004	Miesbauer et al.	709/227
*	F	US-6,581,166	06-2003	Hirst et al.	714/4
*	G	US-6,636,898	10-2003	Ludovici et al.	709/227
*	H	US-6,031,528	02-2000	Langfahl, Jr., J. Craig	709/224
*	I	US-6,646,564	11-2003	Azieres et al.	340/679
*	J	US-7,124,183	10-2006	Pekary et al.	709/224
*	K	US-2004/0162781	08-2004	Searl et al.	705/051
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
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Bib Data Sheet

CONFIRMATION NO. 8431

SERIAL NUMBER	FILING OR 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/820,111	04/08/2004 RULE	709	2155	ALC 3125

APPLICANTS

Denis Armand Proulx, Kanata, CANADA;
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Margaret Rachniowski, Nepean, CANADA;
Afshan Zabihi, Kanata, CANADA;
Macmohana Singh Virdy, Ottawa, CANADA;

** **CONTINUING DATA** ************************* NONE, PBT

** **FOREIGN APPLICATIONS** ******************** YES, PBT

CANADA 2,425,442 04/15/2003

IF REQUIRED, FOREIGN FILING LICENSE GRANTED
** 06/21/2004

			STATE OR COUNTRY	SHEETS DRAWING	TOTAL CLAIMS	INDEPENDENT CLAIMS
Foreign Priority claimed	☑ yes ☐ no		CANADA	13	20	3
35 USC 119 (a-d) conditions met	☑ yes ☐ no ☐ Met after Allowance					
Verified and Acknowledged	Examiner's Signature: Philip Tran	Initials: PBT				

ADDRESS
KRAMER & AMADO, P.C.
Suite 240
1725 Duke Street
Alexandria, VA22314

TITLE
Centralized internet protocol/multi-protocol label switching connectivity verification in a communications network management context

FILING FEE RECEIVED		
770	FEES: Authority has been given in Paper No. __________ to charge/credit DEPOSIT ACCOUNT No. __________ for following:	☐ All Fees ☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other ______________ ☐ Credit

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10820111	PROULX ET AL.
	Examiner	Art Unit
	Tran, Philip B	2155

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/11/2007								
	1	✓								
	2	✓								
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	16	✓								
	17	✓								
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	19	✓								
	20	✓								

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10820111	PROULX ET AL.
	Examiner	Art Unit
	Tran, Philip B	2155

SEARCHED

Class	Subclass	Date	Examiner
709	220, 223, 224	9/11/2007	PBT

SEARCH NOTES

Search Notes	Date	Examiner
East and NPL	9/11/2007	PBT

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner

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TO:	Mail Stop Amendment USPTO
FAX NO.:	(571) 273-8300
FROM:	Terry W. Kramer KRAMER & AMADO, P.C.
DATE:	December 21, 2007
SUBJECT:	U.S. Patent Application Title: CENTRALIZED INTERNET PROTOCOL/MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT Serial No.: 10/820,111 Attorney Docket No.: ALC 3125
PAGES:	INCLUDING COVER PAGE (14)

Message: Submitted herewith are the following:

- Transmittal Form (1 page)
- Amendment (12 pages)

In the event that the fees submitted herewith are insufficient, please charge any remaining balance, or credit any overpayment, to our Deposit Account Number 50-0578.

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DEC-21-2007 11:46 KRAMER & AMADO, P.C. 703 5199802 P.02

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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	10/820,111
Filing Date	April 8, 2004
First Named Inventor	Denis Armand Proulx
Art Unit	2155
Examiner Name	Philip B. Tran
Attorney Docket Number	ALC 3125
Total Number of Pages in This Submission	13

ENCLOSURES (Check all that apply)

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☑ Amendment/Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Reply to Missing Parts/ Incomplete Application
  - ☐ Reply to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert to a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s) ______
  - ☐ Landscape Table on CD
- ☐ After Allowance Communication to TC
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to TC (Appeal Notice, Brief, Reply Brief)
- ☐ Proprietary Information
- ☐ Status Letter
- ☐ Other Enclosure(s) (please identify below):

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	Kramer & Amado, P.C.		
Signature	Terry W. Kramer		
Printed name	Terry W. Kramer		
Date	December 21, 2007	Reg. No.	41,541

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:

Signature	Jimani Walden		
Typed or printed name	Jimani Walden	Date	December 21, 2007

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	Denis Armand Proulx et al.
For	:	CENTRALIZED INTERNET PROTOCOL/MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT
Serial No.:	:	10/820,111
Filed	:	April 8, 2004
Art Unit	:	2155
Examiner	:	Philip B. Tran
Att. Docket	:	ALC 3125
Confirmation No.	:	8431

AMENDMENT UNDER 37 C.F.R § 1.111

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action dated September 24, 2007, please amend the above-identified application as set forth below:

CLAIM AMENDMENTS begin on page 2 of this paper.

REMARKS/ARGUMENTS begin on page 7 of this paper.

Application No: 10/820,111
Attorney's Docket No: ALC 3125

CLAIM AMENDMENTS

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims

1. (Currently Amended) A network management connectivity verification framework comprising:

a. a connectivity verification server performing unattended connectivity verification jobs; and

b. a connectivity verification application for defining connectivity verification jobs, configuring the connectivity verification server accordingly, ~~and displaying configuration~~ displaying connectivity verification results, and specifying, by a user, at least one connectivity verification threshold for comparison to the connectivity verification results.

2. (Original) A connectivity verification framework claimed in claim 1, wherein the connectivity verification jobs are scheduled and the connectivity verification server performs scheduled connectivity verification.

3. (Original) A connectivity verification framework claimed in claim 1, wherein the connectivity verification application further providing a display of connectivity verification results.

4. (Original) A connectivity verification framework claimed in claim 1, wherein the results of each connectivity verification job may be compared against a connectivity profile, a deviation from the connectivity profile being used to raise an alarm.

5. (Original) A connectivity verification framework claimed in claim 3, wherein the connectivity verification results, including alarm information, are further used to generate a network map displaying selected connectivity verification results.

6. (Currently Amended) A method of creating a network connectivity verification test, comprising steps of:

a. defining a connectivity verification job;

b. configuring a connectivity verification server to perform the connectivity verification job; ~~job; and~~

c. displaying connectivity verification results; and

d. specifying, by a user, at least one connectivity verification threshold for comparison to the connectivity verification results.

7. (Currently Amended) The method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises steps of:

a. selecting via an NMS user interface, a pair of source and destination IP objects between which connectivity is to be verified; and

b. specifying a connectivity verification ~~schedule;~~ schedule.

8. (Canceled)

9. (Currently Amended) The method of creating a network connectivity verification test claimed in ~~claim 8~~ claim 6, wherein specifying ~~connectivity thresholds~~ the at least one connectivity verification threshold further comprises specifying a threshold for ~~a~~ at least one of round trip delay, jitter, and packet loss.

10. (Original) The method of creating a network connectivity verification test claimed in claim 7, wherein a selected IP object include one of a router, IP interface, and IP address.

11. (Original) The method of creating a network connectivity verification test claimed in claim 7, wherein the pair of IP objects is selected selecting one of an IP link, an LSP, and a VPN.

12. (Original) The method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises a step of: configuring a connectivity verification parameter including one of a number of ping commands to issue, a ping packet size, ping data fill pattern, a time to wait for response, and a type of service.

13. (Original) The method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises a step of: configuring a connectivity verification parameter including one of a number of traceroute commands to issue, a traceroute packet size, traceroute packet data fill pattern, a time to wait for response, and a type of service.

14. (Currently Amended) A method of performing a network connectivity verification in a network management context comprising steps of:

a. performing scheduled connectivity verification;

b. comparing a connectivity verification result with a connectivity verification threshold, said connectivity verification threshold specified by a user; and

c. raising an alarm if the connectivity verification result has reached the connectivity verification threshold.

15. (Original) The method of performing a network connectivity verification claimed in claim 14, further comprising a step of: storing connectivity verification job on computer readable medium for subsequent access and execution.

16. (Original) The method of performing a network connectivity verification claimed in claim 14, further comprising a step of: highlighting at least one IP object based on one of a connectivity verification job and a connectivity verification result.

17. (Original) The method of performing a network connectivity verification claimed in claim 16, wherein a highlighted object is one of an OSI Layer 2 and OSI Layer 3 object.

18. (Original) The method of performing a network connectivity verification claimed in claim 14, wherein performing scheduled connectivity verification the method further comprising a step of: periodically executing connectivity verification tests.

19. (Original) The method of performing a network connectivity verification claimed in claim 14, wherein performing scheduled connectivity verification the method further comprising a step of: issuing a one of a ping command and traceroute command.

20. (Original) The method of performing a network connectivity verification claimed in claim 14, further comprising a step of: storing historical connectivity verification results on computer readable medium for subsequent access.

REMARKS/ARGUMENTS

Claims 1-7 and 9-20 are pending in the present application. Claims 1, 6, and 14 are independent. Claim 8 is canceled without prejudice to, or disclaimer of, the subject matter recited therein. The subject matter previously recited in claim 8 is incorporated into claims 1, 6, and 14 by this Amendment. The dependency of claim 9 is altered as necessitated by the cancellation of claim 8.

CLAIM OBJECTIONS

In section 1 on page 2, the Office Action objects to claim 7 due to the specified informalities. Claim 7 is amended to address the specified informalities. Applicant respectfully submits that claim 7, as amended, complies with all applicable requirements. Therefore, Applicant respectfully requests that the objection to claim 7 be withdrawn.

REJECTION UNDER 35 U.S.C. § 103

In section 3 on pages 2-5, the Office Action rejects claims 1-3, 5-7, 10, and 11 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,494,831 to Koritzinsky in view of U.S. Patent No. 6,405,248 to Wood. Applicant respectfully traverses this rejection.

Claims 1 and 6 recite "<u>specifying, by a user, at least one connectivity verification threshold</u> for comparison to the connectivity verification results" (emphasis added). Claim 14 contains a similar recitation.

In section 5, on page 6, with respect to the rejection of claim 8, where the quoted subject matter was previously recited, the Office Action correctly concedes that Koritzinsky and Wood fail to disclose, teach, or suggest this subject matter. With respect to this subject matter, however, the Office Action relies on the background of Applicant's specification, alleging that paragraphs [0014] and [0018] are admitted prior art. The Office Action also makes this allegation with respect to paragraphs [0021] and [0022].

Applicant submits that, although paragraphs [0014], [0018], [0021], and [0022] are contained in the "Background" section of the specification, there is no admission that these paragraphs are "prior art" under 35 U.S.C. §102. Rather, Applicant submits that the subject matter described in the specification as "Background" and referred to in the Office Action as admitted prior art is <u>not</u> prior art pursuant to 35 U.S.C. §102. See, *e.g.*, M.P.E.P. §§2132 at II. and 2133.03(d).

Further, even assuming, *arguendo*, that the Office Action is correct in asserting that these paragraphs are admitted prior art, which they are not, Applicant nonetheless disagrees with the rejection. Applicant respectfully submits that the Office Action has mischaracterized the subject matter described in paragraphs [0014] and [0018] of Applicant's specification.

More particularly, paragraph [0014] describes stamping a packet with a time value corresponding to the time at which the ping probe packet was issued to determine delay and jitter. Paragraph [0018] describes providing delay and jitter profiles for each determined transport path. Neither paragraph [0014] nor paragraph [0018] discloses, teaches, or suggests that a connectivity verification <u>threshold</u> is <u>specified by a user</u>.

Accordingly, Applicant respectfully submits that Koritzinsky, Wood, and the allegedly admitted prior art from Applicant's specification fail to disclose, teach, or suggest "specifying, by a user, at least one connectivity verification threshold for comparison to the connectivity verification results," as recited in claims 1 and 6 and similarly recited in claim 14.

Applicant respectfully submits that claims 2, 3, and 5 are allowable based at least on their dependence from claim 1 for the reasons stated above in connection with claim 1. Applicant respectfully submits that claims 7, 10, and 11 are allowable based at least on their dependence from claim 6 for the reasons stated above in connection with claim 6. For at least the forgoing reasons, Applicant respectfully requests that the rejection of claims 1-3, 5-7, 10, and 11 under 35 U.S.C. § 103 be withdrawn.

In section 4 on pages 5-6, the Office Action rejects claim 4 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Koritzinsky in view of Wood and further in view of U.S. Patent No. 6,965,572 to Boodaghians. Applicant respectfully traverses this rejection.

Applicant respectfully submits that claim 4 is allowable based at least on its dependence from claim 1 for the reasons stated above in connection with claim 1. Boodaghians fails to overcome the deficiencies in Koritzinsky and Wood correctly conceded in section 5 on page 6 of the Office Action and the deficiencies in Applicant's allegedly admitted prior described above. For at least the forgoing reasons, Applicant respectfully requests that the rejection of claim 4 under 35 U.S.C. § 103 be withdrawn.

In section 5 on page 6, the Office Action rejects claims 8, 9, 12, and 13 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Koritzinsky in view of Wood and further in view of allegedly admitted prior art. Applicant respectfully traverses this rejection.

Claim 8 is canceled without prejudice to, or disclaimer of, the subject matter recited therein. Further, this rejection is discussed above in connection with an earlier rejection. Applicant respectfully submits that claims 9, 12, and 13 are allowable based at least on their dependence from claim 6 for the reasons stated above in connection with claim 6. For at least the forgoing reasons, Applicant respectfully requests that the rejection of claims 8, 9, 12, and 13 under 35 U.S.C. § 103 be withdrawn.

In section 6 on pages 8-10, the Office Action rejects claims 14-18 and 20 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Koritzinsky in view of Boodaghians. Applicant respectfully traverses this rejection.

Applicant respectfully submits that claims 14-18 and 20 are allowable based at least on their dependence from claim 14 for the reasons stated above in connection with claim 14. Boodaghians fails to overcome the deficiencies in Koritzinsky correctly conceded in section 5 on page 6 of the Office Action and the deficiencies in Applicant's allegedly admitted prior described above. For at least the forgoing reasons, Applicant respectfully requests that the rejection of claims 14-18 and 20 under 35 U.S.C. § 103 be withdrawn.

In section 7 on page 10, the Office Action rejects claim 19 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Koritzinsky in view of Boodaghians and further in view of allegedly admitted prior art. Applicant respectfully traverses this rejection.

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Attorney's Docket No: ALC 3125

With respect to the subject matter recited in claim 19, the Office Action relies on the background of Applicant's specification, alleging that paragraphs [0014], [0021], and [0022] are admitted prior art. The errors in this incorrect reliance are discussed above in connection with another rejection. Further, even assuming, *arguendo*, that the Office Action is correct in asserting that these paragraphs are admitted prior art, which they are not, Applicant respectfully submits that claim 19 is allowable based at least on its dependence from claim 14 for the reasons stated above in connection with claim 14. Boodaghians and the allegedly admitted prior art in paragraphs [0014], [0021], and [0022] of Applicant's specification fail to overcome the deficiencies in Koritzinsky correctly conceded in section 5 on page 6 of the Office Action.

For at least the forgoing reasons, Applicant respectfully requests that the rejection of claims 14-18 and 20 under 35 U.S.C. § 103 be withdrawn.

CONCLUSION

While we believe that the instant amendment places the application in condition for allowance, should the Examiner have any further comments or suggestions, it is respectfully requested that the Examiner telephone the undersigned attorney in order to expeditiously resolve any outstanding issues.

In the event that the fees submitted prove to be insufficient in connection with the filing of this paper, please charge our Deposit Account Number 50-0578 and please credit any excess fees to such Deposit Account.

Respectfully submitted,
KRAMER & AMADO, P.C.

Terry W. Kramer

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Date: December 20, 2007

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PTO/SB/06 (07-06)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 10/820,111	Filing Date 04/08/2004	☐ To be Mailed

APPLICATION AS FILED – PART I

FOR	NUMBER FILED (Column 1)	NUMBER EXTRA (Column 2)	SMALL ENTITY ☐ RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	12/21/2007	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 19	Minus	** 20	= 0	X $ =		OR	X $50=	0
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $ =		OR	X $210=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/MARSHA R. RICHARDS/

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,111	04/08/2004	Denis Armand Proulx	ALC 3125	8431

7590 04/17/2008

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EXAMINER	
TRAN, PHILIP B	
ART UNIT	PAPER NUMBER
2155	

MAIL DATE	DELIVERY MODE
04/17/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/820,111	PROULX ET AL.
	Examiner	**Art Unit**
	Philip B. Tran	2155

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 December 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7 and 9-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 9-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Response to Amendment

Notice to Applicant

1. This communication is in response to amendment filed December 21, 2007. Claim 8 has been canceled. Claims 1, 6-7, 9 and 14 have been amended. Therefore, claims 1-7 and 9-20 are pending for further examination.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-7 and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koritzinsky, U.S. Pat. No. 6,494,831 in view of Wood, U.S. Pat. No. 6,405,248 and further in view of Misra, U.S. Pat. No. 7,162,250.

Regarding claim 1, Koritzinsky teaches a network management connectivity verification framework comprising a connectivity verification server performing unattended connectivity verification jobs and a connectivity verification application for defining connectivity verification jobs, configuring the connectivity verification server accordingly (= verifying network connectivity between a diagnostic system and a remote service facility) [see Abstract and Figs. 1-5 and Col. 12, Lines 13-29].

Koritzinsky does not explicitly teach displaying connectivity verification results. However, Wood, in the same field of monitoring network nodes connectivity endeavor, discloses collecting connectivity information and displaying the network topology information [see Wood, Abstract and Col. 1, Line 61 to Col. 2, Line 9]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Wood into the teaching of Koritzinsky in order to efficiently keep track of network connectivity information and quickly identify alerting condition for network management purpose.

In addition, Koritzinsky and Wood do not explicitly teach specifying, by a user, at least one connectivity verification threshold for comparison to the connectivity verification results. However, Misra, in the same field of monitoring network nodes connectivity endeavor, discloses obtaining performance metrics and comparing against configured thresholds [see Fig. 6, step 601]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Misra into the teaching of Koritzinsky-Wood in order to efficiently keep track of

network connectivity information and quickly adjust threshold condition for network management purpose.

Regarding claim 2, Koritzinsky further teaches a connectivity verification framework claimed in claim 1, wherein the connectivity verification jobs are scheduled and the connectivity verification server performs scheduled connectivity verification [see Col. 2, Line 49 to Col. 3, Line 10 and Col. 6, Lines 50-65 and Col. 8, Lines 31-43].

Regarding claim 3, Koritzinsky does not explicitly teach a connectivity verification framework claimed in claim 1, wherein the connectivity verification application further providing a display of connectivity verification results. However, Wood, in the same field of monitoring network nodes connectivity endeavor, discloses collecting connectivity information and displaying the network topology information [see Wood, Abstract and Col. 1, Line 61 to Col. 2, Line 9]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Wood into the teaching of Koritzinsky for the same reason set forth above to claim 1.

Regarding claim 4, Koritzinsky further teaches a connectivity verification framework claimed in claim 1, wherein the results of each connectivity verification job is stored in a log and there exists an alert module for generating alerts in response to problems with connectivity [see Col. 6, Line 66 to Col. 7, Line 34 and Col. 7, Line 62 to

Col. 8, Line 30]. Koritzinsky does not explicitly teach the results of each connectivity verification job may be compared against a connectivity profile, a deviation from the connectivity profile being used to raise an alarm.

However, Misra, in the same field of monitoring network nodes connectivity endeavor, discloses obtaining performance metrics and comparing against configured thresholds [see Fig. 6, step 601]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of obtaining performance metrics and comparing against configured thresholds of Misra into the teaching of generating alerts in response to problems with connectivity of Koritzinsky in order to efficiently keep track of network connectivity information and identify specific connectivity problems for network management purpose so that the problems can be quickly resolved.

Regarding claim 5, Koritzinsky further teaches alarm information [see Abstract and Col. 6, Line 66 to Col. 7, Line 34 and Col. 7, Line 62 to Col. 8, Line 30]. Koritzinsky does not explicitly teach a connectivity verification framework claimed in claim 3, wherein the connectivity verification results are further used to generate a network map displaying selected connectivity verification results. However, Wood, in the same field of monitoring network nodes connectivity endeavor, discloses collecting connectivity information and displaying the network topology information [see Wood, Abstract and Col. 1, Line 61 to Col. 2, Line 9]. It would have been obvious to one of ordinary skill in

the art at the time of the invention was made to incorporate the teaching of Wood into the teaching of Koritzinsky for the same reason set forth above to claim 1.

Claim 6 is rejected under the same rationale set forth above to claim 1.

Regarding claim 7, Koritzinsky further teaches the method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprising selecting via an NMS user interface and specifying a connectivity verification schedule [see Col. 2, Line 49 to Col. 3, Line 10 and Col. 6, Lines 50-65 and Col. 8, Lines 31-43], and verifying the network address location of system [see Col. 4, Lines 1-8]. Koritzinsky does not explicitly teach a pair of source and destination IP objects between which connectivity is to be verified. However, Wood, in the same field of monitoring network nodes connectivity endeavor, discloses collecting connectivity information and displaying the network topology information including address table information [see Wood, Abstract and Col. 1, Line 61 to Col. 2, Line 9 and Col. 2, Lines 12-60]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Wood into the teaching of Koritzinsky for the same reason set forth above to claim 1.

Regarding claim 9, Koritzinsky and Wood do not explicitly teach the method of creating a network connectivity verification test claimed in claim 6, wherein specifying the at least one connectivity verification threshold further comprises specifying a

threshold for at least one of round trip delay, jitter, and packet loss. However, Misra, in the same field of monitoring network nodes connectivity endeavor, discloses obtaining performance metrics and comparing against configured thresholds [see Fig. 6, step 601] and measuring performance metrics such as packet transmission delays, packet loss rates, packet transmission delay variation (jitter), processor utilization, memory utilization, etc [see Misra, Col. 9, Lines 27-39]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Misra into the teaching of Koritzinsky-Wood in order to efficiently keep track of network connectivity information and quickly identify specific connectivity problems for network management purpose.

Regarding claim 10, Koritzinsky further teaches the method of creating a network connectivity verification test claimed in claim 7, wherein a selected IP object include one of a router, IP interface, and IP address [see Col. 6, Lines 13-34 and Col. 11, Lines 8-40].

Regarding claim 11, Koritzinsky further teaches the method of creating a network connectivity verification test claimed in claim 7, wherein the pair of IP objects is selected selecting one of an IP link, an LSP, and a VPN [see Col. 6, Lines 13-34].

4. Claims 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koritzinsky, U.S. Pat. No. 6,494,831 in view of Wood, U.S. Pat. No. 6,405,248 and further in view of Misra, U.S. Pat. No. 7,162,250 and further in view of admitted prior art (APA) [the background of instant application's specification].

Regarding claims 12-13, Koritzinsky and Wood and Misra do not explicitly teach the method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises a step of: configuring a connectivity verification parameter including one of a number of ping commands to issue, a ping packet size, ping data fill pattern, a time to wait for response, and a type of service and configuring a connectivity verification parameter including one of a number of traceroute commands to issue, a traceroute packet size, traceroute packet data fill pattern, a time to wait for response, and a type of service.

However, the admitted prior art (APA) in the background of the instant application's specification discloses verifying connectivity between individual routers including pining/tracerout test [see APA, Paragraphs 0014 & 0021-0022]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of APA into the teaching of Koritzinsky and Wood and Misra in order to quickly identify specific connectivity problems for network management purpose.

5. Claims 14-18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koritzinsky, U.S. Pat. No. 6,494,831 in view of Misra, U.S. Pat. No. 7,162,250.

Regarding claim 14, Koritzinsky teaches a method of performing a network connectivity verification in a network management context comprising steps of performing scheduled connectivity verification (= verifying network connectivity between a diagnostic system and a remote service facility) [see Abstract and Figs. 1-5 and Col. 12, Lines 13-29] and generating alerts in response to problems with connectivity [see Col. 6, Line 66 to Col. 7, Line 34 and Col. 7, Line 62 to Col. 8, Line 30]. Koritzinsky does not explicitly teach comparing a connectivity verification result with a threshold, said connectivity verification threshold specified by a user.

However, Misra, in the same field of monitoring network nodes connectivity endeavor, discloses obtaining performance metrics and comparing against configured thresholds [see Fig. 6, step 601]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of obtaining performance metrics and comparing against configured thresholds of Misra into the teaching of generating alerts in response to problems with connectivity of Koritzinsky in order to efficiently keep track of network connectivity information and identify specific connectivity problems for network management purpose so that the problems can be quickly resolved.

Regarding claim 15, Koritzinsky further teaches the method of performing a network connectivity verification claimed in claim 14, further comprising a step of: storing connectivity verification job on computer readable medium for subsequent

access and execution [see Col. 6, Line 66 to Col. 7, Line 34 and Col. 7, Line 62 to Col. 8, Line 30].

Regarding claims 16-17, Koritzinsky further teaches the method of performing a network connectivity verification claimed in claim 14, further comprising a step of: highlighting at least one IP object based on one of a connectivity verification job and a connectivity verification result and wherein a highlighted object is one of an OSI Layer 2 and OSI Layer 3 object [see Col. 6, Lines 13-34 and Col. 11, Lines 8-40].

Regarding claim 18, Koritzinsky further teaches the method of performing a network connectivity verification claimed in claim 14, wherein performing scheduled connectivity verification the method further comprising a step of: periodically executing connectivity verification tests [see Col. 12, Lines 13-31].

Regarding claim 20, Koritzinsky further teaches the method of performing a network connectivity verification claimed in claim 14, further comprising a step of: storing historical connectivity verification results on computer readable medium for subsequent access [see Col. 6, Line 66 to Col. 7, Line 34 and Col. 7, Line 62 to Col. 8, Line 30].

6. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Koritzinsky, U.S. Pat. No. 6,494,831 in view of Misra, U.S. Pat. No. 7,162,250 and further in view of admitted prior art (APA) [the background of instant application's specification].

Regarding claim 19, Koritzinsky and Misra do not explicitly teach the method of performing a network connectivity verification claimed in claim 14, wherein performing scheduled connectivity verification the method further comprising a step of: issuing a one of a ping command and traceroute command.

However, the admitted prior art (APA) in the background of the instant application's specification discloses verifying connectivity between individual routers including pining/tracerout test [see APA, Paragraphs 0014 & 0021-0022]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of APA into the teaching of Koritzinsky and Misra in order to quickly identify specific connectivity problems for network management purpose.

Other References Cited

7. The following references cited by the examiner but not relied upon are considered pertinent to applicant's disclosure.

A) Miesbauer et al, U.S. Pat. No. 6,694,367.

B) Mastrianni et al, U.S. Pat. No. 6,615,276.

8. Applicant's arguments with respect to claims 1-7 and 9-20 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. Applicant’s amendments necessitate the change ground of rejections. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CAR 1.136(a).

A SHORTENED STATUTORY PERIOD FOR REPLY TO THIS FINAL ACTION IS SET TO EXPIRE THREE MONTHS FROM THE MAILING DATE OF THIS ACTION. IN THE EVENT A FIRST REPLY IS FILED WITHIN TWO MONTHS OF THE MAILING DATE OF THIS FINAL ACTION AND THE ADVISORY ACTION IS NOT MAILED UNTIL AFTER THE END OF THE THREE-MONTH SHORTENED STATUTORY PERIOD, THEN THE SHORTENED STATUTORY PERIOD WILL EXPIRE ON THE DATE THE ADVISORY ACTION IS MAILED, AND ANY EXTENSION FEE PURSUANT TO 37 CAR 1.136(A) WILL BE CALCULATED FROM THE MAILING DATE OF THE ADVISORY ACTION. IN NO EVENT, HOWEVER, WILL THE STATUTORY PERIOD FOR REPLY EXPIRE LATER THAN SIX MONTHS FROM THE MAILING DATE OF THIS FINAL ACTION.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Philip Tran whose telephone number is (571) 272-3991. The Group fax phone number is (571) 273-8300. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Saleh Najjar, can be reached on (571) 272-4006.

11. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Philip B Tran/
Primary Examiner, Art Unit 2155
April 11, 2008

Notice of References Cited	Application/Control No. 10/820,111	Applicant(s)/Patent Under Reexamination PROULX ET AL.	
	Examiner Philip B. Tran	Art Unit 2155	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-7,162,250	01-2007	Misra, Archan	455/453
*	B	US-6,694,367	02-2004	Miesbauer et al.	709/227
*	C	US-6,615,276	09-2003	Mastrianni et al.	709/220
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10820111	PROULX ET AL.
	Examiner	Art Unit
	Tran, Philip B	2155

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/11/2007	04/11/2008							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	✓							
	7	✓	✓							
	8	✓	-							
	9	✓	✓							
	10	✓	✓							
	11	✓	✓							
	12	✓	✓							
	13	✓	✓							
	14	✓	✓							
	15	✓	✓							
	16	✓	✓							
	17	✓	✓							
	18	✓	✓							
	19	✓	✓							
	20	✓	✓							

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10820111	PROULX ET AL.
	Examiner	**Art Unit**
	Tran, Philip B	2155

SEARCHED

Class	Subclass	Date	Examiner
709	220, 223, 224	9/11/2007	PBT
Updated	Search	4/11/2008	PBT

SEARCH NOTES

Search Notes	Date	Examiner
East and NPL	9/11/2007	PBT
Updated Search	4/11/2008	PBT

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner

Electronic Patent Application Fee Transmittal

Application Number:	10820111
Filing Date:	08-Apr-2004
Title of Invention:	Centralized internet protocol/multi-protocol label switching connectivity verification in a communications network management context
First Named Inventor/Applicant Name:	Denis Armand Proulx
Filer:	Terry Wayne Kramer/Wanda Ricks
Attorney Docket Number:	ALC 3125
Filed as Large Entity	

Utility Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Request for continued examination	1801	1	810	810
		Total in USD ($)		**810**

Electronic Acknowledgement Receipt

EFS ID:	3304867
Application Number:	10820111
International Application Number:	
Confirmation Number:	8431
Title of Invention:	Centralized internet protocol/multi-protocol label switching connectivity verification in a communications network management context
First Named Inventor/Applicant Name:	Denis Armand Proulx
Correspondence Address:	KRAMER & AMADO, P.C. - Suite 240 1725 Duke Street Alexandria VA 22314 US 7035199801 -
Filer:	Terry Wayne Kramer/Wanda Ricks
Filer Authorized By:	Terry Wayne Kramer
Attorney Docket Number:	ALC 3125
Receipt Date:	15-MAY-2008
Filing Date:	08-APR-2004
Time Stamp:	09:50:53
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Credit Card
Payment was successfully received in RAM	$810

RAM confirmation Number	3252
Deposit Account	
Authorized User	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	ALC3125RCE.pdf	345108 8e1eecd5e4a507e15ff42d15eb552b086bee8db4	no	3

Warnings:

This is not a USPTO supplied RCE SB30 form.

Information:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
2		ALC3125AMEND.pdf	1969489 d5652a8a9cc905ba85fcfc9cb3750e3f6b47c5ac	yes	10

Multipart Description/PDF files in .zip description

Document Description	Start	End
Amendment After Final	1	1
Claims	2	7
Applicant Arguments/Remarks Made in an Amendment	8	10

Warnings:

Information:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
3	Fee Worksheet (PTO-06)	fee-info.pdf	8242 376ecffab8ba55d2b6ddc3eb87542b0cf441e438	no	2

Warnings:

Information:

Total Files Size (in bytes):	2322839

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (03/08)
Approved for use through 05/31/2008. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

REQUEST FOR CONTINUED EXAMINATION(RCE)TRANSMITTAL
(Submitted Only via EFS-Web)

Application Number	10/820,111	Filing Date	2008-04-08	Docket Number (if applicable)	ALC 3125	Art Unit	2155
First Named Inventor	Denis Armand Proulx			Examiner Name	Philip B. Tran		

This is a Request for Continued Examination (RCE) under 37 CFR 1.114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. The Instruction Sheet for this form is located at WWW.USPTO.GOV

SUBMISSION REQUIRED UNDER 37 CFR 1.114

Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

- ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on ____________
- ☐ Other ____________

☒ Enclosed

- ☒ Amendment/Reply
- ☐ Information Disclosure Statement (IDS)
- ☐ Affidavit(s)/ Declaration(s)
- ☐ Other ____________

MISCELLANEOUS

☐ Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a period of months ____________
(Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

☐ Other ____________

FEES

☒ **The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.**
The Director is hereby authorized to charge any underpayment of fees, or credit any overpayments, to
Deposit Account No 500578

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

☒ Patent Practitioner Signature

☐ Applicant Signature

Doc code: RCEX
Doc description: Request for Continued Examination (RCE)

PTO/SB/30EFS (03/08)
Approved for use through 05/31/2008. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Signature of Registered U.S. Patent Practitioner			
Signature	/Terry W. Kramer/	Date (YYYY-MM-DD)	2008-05-14
Name	Terry W. Kramer	Registration Number	41541

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	Denis Armand Proulx et al.
For	:	CENTRALIZED INTERNET PROTOCOL/MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT
Serial No.:	:	10/820,111
Filed	:	April 8, 2004
Art Unit	:	2155
Examiner	:	Philip B. Tran
Att. Docket	:	ALC 3125
Confirmation No.	:	8431

AMENDMENT UNDER 37 C.F.R § 1.114

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Final Office Action dated April 17, 2008, and further to the Request for Continued Examination (RCE) filed herewith, please amend the above-identified application as set forth below:

CLAIM AMENDMENTS begin on page 2 of this paper.

REMARKS/ARGUMENTS begin on page 8 of this paper.

Application No: 10/820,111
Attorney's Docket No: ALC 3125

CLAIM AMENDMENTS

This listing of claims will replace all prior versions and listings of claims in the application.

Listing of Claims

1. (Currently Amended) A network management connectivity verification framework comprising:

~~a.~~ a connectivity verification server ~~performing~~ that performs unattended connectivity verification jobs; and

~~b.~~ a connectivity verification application for:

defining connectivity verification jobs,

configuring the connectivity verification server accordingly,

displaying connectivity verification results, ~~and~~

specifying, by a user, at least one connectivity verification threshold for comparison to the connectivity verification results, and

displaying and highlighting Layer-2 and Layer-3 objects affected by an alarm.

2. (Original) A connectivity verification framework claimed in claim 1, wherein the connectivity verification jobs are scheduled and the connectivity verification server performs scheduled connectivity verification.

3. (Currently Amended) A connectivity verification framework claimed in claim 1, wherein the connectivity verification application further ~~providing~~ provides a display of connectivity verification results.

4. (Currently Amended) A connectivity verification framework claimed in claim 1, wherein ~~the~~ results of each connectivity verification job may be compared against a connectivity profile, a deviation from the connectivity profile being used to raise an alarm.

5. (Original) A connectivity verification framework claimed in claim 3, wherein the connectivity verification results, including alarm information, are further used to generate a network map displaying selected connectivity verification results.

6. (Currently Amended) A method of creating a network connectivity verification test, comprising steps of:

~~a.~~ defining a connectivity verification job;

~~b.~~ configuring a connectivity verification server to perform the connectivity verification job;

~~c.~~ displaying connectivity verification results; ~~and~~

~~d.~~ specifying, by a user, at least one connectivity verification threshold for comparison to the connectivity verification results; and

displaying and highlighting Layer-2 and Layer-3 objects affected by an alarm.

7. (Currently Amended) The method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises steps of:

~~a.~~ selecting via an NMS user interface, a pair of source and destination IP objects between which connectivity is to be verified; and

~~b.~~ specifying a connectivity verification schedule.

8. (Canceled).

9. (Previously Presented) The method of creating a network connectivity verification test claimed in claim 6, wherein specifying the at least one connectivity verification threshold further comprises specifying a threshold for at least one of round trip delay, jitter, and packet loss.

10. (Original) The method of creating a network connectivity verification test claimed in claim 7, wherein a selected IP object include one of a router, IP interface, and IP address.

11. (Currently Amended) The method of creating a network connectivity verification test claimed in claim 7, wherein the pair of <u>source and destination</u> IP objects is selected ~~selecting~~ <u>from</u> one of an IP link, an LSP, and a VPN.

12. (Original) The method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises a step of: configuring a connectivity verification parameter including one of a number of ping commands to issue, a ping packet size, ping data fill pattern, a time to wait for response, and a type of service.

13. (Original) The method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises a step of: configuring a connectivity verification parameter including one of a number of traceroute commands to issue, a traceroute packet size, traceroute packet data fill pattern, a time to wait for response, and a type of service.

14. (Currently Amended) A method of performing a network connectivity verification in a network management context comprising steps of:

~~a.~~ performing scheduled connectivity verification;

~~b.~~ comparing a connectivity verification result with a connectivity verification threshold, said connectivity verification threshold specified by a user; ~~and~~

~~c.~~ raising an alarm if the connectivity verification result has reached the connectivity verification threshold; and

displaying and highlighting Layer-2 and Layer-3 objects affected by an alarm.

15. (Currently Amended) The method of performing a network connectivity verification claimed in claim 14, further comprising a step of~~: storing~~ storing a connectivity verification job on a computer readable medium for subsequent access and execution.

16. (Currently Amended) The method of performing a network connectivity verification claimed in claim 14, further comprising a step of~~: highlighting~~ highlighting at least one IP object based on one of a connectivity verification job and a connectivity verification result.

17. (Original) The method of performing a network connectivity verification claimed in claim 16, wherein a highlighted object is one of an OSI Layer 2 and OSI Layer 3 object.

18. (Currently Amended) The method of performing a network connectivity verification claimed in claim 14, wherein performing scheduled connectivity verification ~~the method~~ further ~~comprising~~ comprises a step of~~: periodically~~ periodically executing connectivity verification tests.

19. (Currently Amended) The method of performing a network connectivity verification claimed in claim 14, wherein performing scheduled connectivity verification ~~the method~~ further ~~comprising~~ comprises a step of~~: issuing~~ issuing at least one ~~a one~~ of a ping command and traceroute command.

20. (Currently Amended) The method of performing a network connectivity verification claimed in claim 14, further comprising a step of~~: storing~~ storing historical connectivity verification results on a computer readable medium for subsequent access.

REMARKS/ARGUMENTS

Claims 1-7 and 9-20 are pending in the present application. Claims 1, 6, and 14 are independent. Claims 1, 3-4, 6-7, 11, 14-16, and 18-20 are amended.

REJECTION UNDER 35 U.S.C. § 103

In section 3 on pages 2-7, the Final Office Action rejects claims 1-7 and 9-11 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,494,831 to Koritzinsky (hereinafter "Koritzinsky") in view of U.S. Patent No. 6,405,248 to Wood (hereinafter "Wood"), further in view of U.S. Patent No. 7,162,250 to Misra (hereinafter "Misra"). In section 4 on page 8, the Final Office Action rejects claims 12 and 13 as allegedly being unpatentable over Koritzinsky, Wood, and Misra, further in view of Admitted Prior Art (hereinafter "APA"). In section 5 on pages 8-10, the Final Office Action rejects claims 14-18 and 20 as allegedly being unpatentable over Koritzinsky and Misra. In section 6 on page 11, the Final Office Action rejects claim 19 as allegedly being unpatentable over Koritzinsky, Misra, and APA. Applicant respectfully traverses these rejections.

Independent claims 1, 6, and 14 recite "displaying and highlighting Layer-2 and Layer-3 objects affected by an alarm" (emphasis added). Support for this subject matter appears in the specification in, for example, paragraph [56] on page 15.

Applicant respectfully submits that Koritzinsky fails to disclose, teach, or suggest this subject matter. Page 10 of the Office Action alleges that Koritzinsky discloses highlighted objects in two locations: lines 13-34 of column 6 and lines 8-40 of column 11. Applicant

respectfully submits that neither the cited portions nor Koritzinsky as a whole disclose highlighting Layer-2 and Layer-3 objects affected by an alarm.

Instead of displaying and highlighting an object, Koritzinsky uses an alert module, as described on lines 27-29 of column 7. While this module generates alerts in response to problems with connectivity, there is no disclosure of it displaying or highlighting Layer-2 and Layer-3 objects. Moreover, as described on lines 24-29 of column 9, instead of identifying particular objects, these alerts are intended to prompt operator intervention to investigate the nature of the connectivity problem. Wood, Misra and the allegedly Admitted Prior Art fail to overcome the deficiencies of Koritzinsky.

Accordingly, Applicant respectfully submits that Koritzinsky, Wood, Misra and the allegedly Admitted Prior Art from Applicant's specification fail to disclose, teach, or suggest "<u>displaying and highlighting</u> Layer-2 and Layer-3 objects affected by an alarm," as recited in independent claims 1, 6, and 14.

Applicant respectfully submits that claims 2-5 are allowable based at least on their dependence from claim 1 for the reasons stated above in connection with claim 1. Applicant respectfully submits that claims 7 and 9-13 are allowable based at least on their dependence from claim 6 for the reasons stated above in connection with claim 6. Applicant respectfully submits that claims 15-20 are allowable based at least on their dependence from claim 14 for the reasons stated above in connection with claim 14.

For at least the forgoing reasons, Applicant respectfully requests that the rejection of claims 1-7 and 8-20 under 35 U.S.C. § 103 be withdrawn.

CONCLUSION

While we believe that the instant amendment places the application in condition for allowance, should the Examiner have any further comments or suggestions, it is respectfully requested that the Examiner telephone the undersigned attorney in order to expeditiously resolve any outstanding issues.

In the event that the fees submitted prove to be insufficient in connection with the filing of this paper, please charge our Deposit Account Number 50-0578 and please credit any excess fees to such Deposit Account.

Respectfully submitted,
KRAMER & AMADO, P.C.

Terry W. Kramer

Date: May 13, 2008

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Fax: 703-519-9802

PATENT APPLICATION FEE DETERMINATION RECORD
Substitute for Form PTO-875

Application or Docket Number: 10/820,111
Filing Date: 04/08/2004
☐ To be Mailed

APPLICATION AS FILED – PART I

FOR	NUMBER FILED (Column 1)	NUMBER EXTRA (Column 2)	SMALL ENTITY ☐ RATE ($)	FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 05/15/2008	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 19	Minus	** 20	= 0	X $ =		OR	X $50=	0
Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $ =		OR	X $210=	0
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	**0**

AMENDMENT	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/DEBRA R. WYATT/

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,111	04/08/2004	Denis Armand Proulx	ALC 3125	8431

7590 06/24/2008

KRAMER & AMADO, P.C.
Suite 240
1725 Duke Street
Alexandria, VA 22314

EXAMINER	
TRAN, PHILIP B	

ART UNIT	PAPER NUMBER
2155	

MAIL DATE	DELIVERY MODE
06/24/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/820,111	PROULX ET AL.
	Examiner	Art Unit
	Philip B. Tran	2155

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 May 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7 and 9-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7 and 9-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 1 and 6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 1, it is unclear when an alarm is occurred. It seems that claim 1 has missing essential steps of “comparing the connectivity verification results to at least one specified connectivity verification threshold” and “”raising an alarm if at least one of the connectivity verification results has reached at least one specified connectivity verification threshold” before layer-2 and layer-3 objects affected by an alarm can be displayed and highlighted.

Regarding claim 6, it is unclear when an alarm is occurred. It seems that claim 6 has missing essential steps of “comparing the connectivity verification results to at least one specified connectivity verification threshold” and “”raising an alarm if at least one of the connectivity verification results has reached at least one specified connectivity verification threshold” before layer-2 and layer-3 objects affected by an alarm can be displayed and highlighted.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-7 and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koritzinsky, U.S. Pat. No. 6,494,831 in view of Wood, U.S. Pat. No. 6,405,248 and further in view of Misra, U.S. Pat. No. 7,162,250 and further in view of Rabe et al (Hereafter, Rabe), U.S. Pat. No. 7,194,538.

Regarding claim 1, Koritzinsky teaches a network management connectivity verification framework comprising a connectivity verification server performing unattended connectivity verification jobs and a connectivity verification application for defining connectivity verification jobs, configuring the connectivity verification server accordingly (= verifying network connectivity between a diagnostic system and a remote service facility) [see Abstract and Figs. 1-5 and Col. 12, Lines 13-29].

Koritzinsky does not explicitly teach displaying connectivity verification results. However, Wood, in the same field of monitoring network nodes connectivity endeavor, discloses collecting connectivity information and displaying the network topology information [see Wood, Abstract and Col. 1, Line 61 to Col. 2, Line 9]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Wood into the teaching of Koritzinsky in order to efficiently keep track of network connectivity information and quickly identify alerting condition for network management purpose.

In addition, Koritzinsky and Wood do not explicitly teach specifying, by a user, at least one connectivity verification threshold for comparison to the connectivity verification results. However, Misra, in the same field of monitoring network nodes connectivity endeavor, discloses obtaining performance metrics and comparing against configured thresholds [see Misra, Fig. 6, step 601]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Misra into the teaching of Koritzinsky-Wood in order to efficiently keep track of network connectivity information and quickly adjust threshold condition for network management purpose.

Moreover, Koritzinsky further teaches IP address related to connectivity problems or failures as one of example of layer-2/layer-3 object related to an alarm/alert in the network [see Koritzinsky, Col. 11, Lines 8-40]. Koritzinsky-Wood-Misra do not explicitly teach highlighting objects affected by alarm/alert. However, Rabe, in the same field of monitoring network nodes connectivity endeavor, discloses highlighting objects that

have active alerts [see Rabe, Col. 6, Lines 4-30]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Rabe into the teaching of Koritzinsky-Wood-Misra in order to efficiently keep track of network connectivity information and quickly identify alerting condition for network management purpose.

Regarding claim 2, Koritzinsky further teaches a connectivity verification framework claimed in claim 1, wherein the connectivity verification jobs are scheduled and the connectivity verification server performs scheduled connectivity verification [see Col. 2, Line 49 to Col. 3, Line 10 and Col. 6, Lines 50-65 and Col. 8, Lines 31-43].

Regarding claim 3, Koritzinsky does not explicitly teach a connectivity verification framework claimed in claim 1, wherein the connectivity verification application further providing a display of connectivity verification results. However, Wood, in the same field of monitoring network nodes connectivity endeavor, discloses collecting connectivity information and displaying the network topology information [see Wood, Abstract and Col. 1, Line 61 to Col. 2, Line 9]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Wood into the teaching of Koritzinsky for the same reason set forth above to claim 1.

Regarding claim 4, Koritzinsky further teaches a connectivity verification framework claimed in claim 1, wherein the results of each connectivity verification job is

stored in a log and there exists an alert module for generating alerts in response to problems with connectivity [see Col. 6, Line 66 to Col. 7, Line 34 and Col. 7, Line 62 to Col. 8, Line 30]. Koritzinsky does not explicitly teach the results of each connectivity verification job may be compared against a connectivity profile, a deviation from the connectivity profile being used to raise an alarm.

However, Misra, in the same field of monitoring network nodes connectivity endeavor, discloses obtaining performance metrics and comparing against configured thresholds [see Fig. 6, step 601]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of obtaining performance metrics and comparing against configured thresholds of Misra into the teaching of generating alerts in response to problems with connectivity of Koritzinsky in order to efficiently keep track of network connectivity information and identify specific connectivity problems for network management purpose so that the problems can be quickly resolved.

Regarding claim 5, Koritzinsky further teaches alarm information [see Abstract and Col. 6, Line 66 to Col. 7, Line 34 and Col. 7, Line 62 to Col. 8, Line 30]. Koritzinsky does not explicitly teach a connectivity verification framework claimed in claim 3, wherein the connectivity verification results are further used to generate a network map displaying selected connectivity verification results. However, Wood, in the same field of monitoring network nodes connectivity endeavor, discloses collecting connectivity information and displaying the network topology information [see Wood, Abstract and

Col. 1, Line 61 to Col. 2, Line 9]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Wood into the teaching of Koritzinsky for the same reason set forth above to claim 1.

Claim 6 is rejected under the same rationale set forth above to claim 1.

Regarding claim 7, Koritzinsky further teaches the method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprising selecting via an NMS user interface and specifying a connectivity verification schedule [see Col. 2, Line 49 to Col. 3, Line 10 and Col. 6, Lines 50-65 and Col. 8, Lines 31-43], and verifying the network address location of system [see Col. 4, Lines 1-8]. Koritzinsky does not explicitly teach a pair of source and destination IP objects between which connectivity is to be verified. However, Wood, in the same field of monitoring network nodes connectivity endeavor, discloses collecting connectivity information and displaying the network topology information including address table information [see Wood, Abstract and Col. 1, Line 61 to Col. 2, Line 9 and Col. 2, Lines 12-60]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Wood into the teaching of Koritzinsky for the same reason set forth above to claim 1.

Regarding claim 9, Koritzinsky-Wood-Rabe do not explicitly teach the method of creating a network connectivity verification test claimed in claim 6, wherein specifying

the at least one connectivity verification threshold further comprises specifying a threshold for at least one of round trip delay, jitter, and packet loss. However, Misra, in the same field of monitoring network nodes connectivity endeavor, discloses obtaining performance metrics and comparing against configured thresholds [see Misra, Fig. 6, step 601] and measuring performance metrics such as packet transmission delays, packet loss rates, packet transmission delay variation (jitter), processor utilization, memory utilization, etc [see Misra, Col. 9, Lines 27-39]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Misra into the teaching of Koritzinsky-Wood-Rabe in order to efficiently keep track of network connectivity information and quickly identify specific connectivity problems for network management purpose.

Regarding claim 10, Koritzinsky further teaches the method of creating a network connectivity verification test claimed in claim 7, wherein a selected IP object include one of a router, IP interface, and IP address [see Col. 6, Lines 13-34 and Col. 11, Lines 8-40].

Regarding claim 11, Koritzinsky further teaches the method of creating a network connectivity verification test claimed in claim 7, wherein the pair of IP objects is selected selecting one of an IP link, an LSP, and a VPN [see Col. 6, Lines 13-34].

5. Claims 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koritzinsky, U.S. Pat. No. 6,494,831 in view of Wood, U.S. Pat. No. 6,405,248 and further in view of Misra, U.S. Pat. No. 7,162,250 and further in view of Rabe et al (Hereafter, Rabe), U.S. Pat. No. 7,194,538 and further in view of admitted prior art (APA) [the background of instant application's specification].

Regarding claims 12-13, Koritzinsky-Wood-Misra-Rabe do not explicitly teach the method of creating a network connectivity verification test claimed in claim 6, wherein defining the connectivity verification job further comprises a step of: configuring a connectivity verification parameter including one of a number of ping commands to issue, a ping packet size, ping data fill pattern, a time to wait for response, and a type of service and configuring a connectivity verification parameter including one of a number of traceroute commands to issue, a traceroute packet size, traceroute packet data fill pattern, a time to wait for response, and a type of service.

However, the admitted prior art (APA) in the background of the instant application's specification discloses verifying connectivity between individual routers including pining/tracerout test [see APA, Paragraphs 0014 & 0021-0022]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of APA into the teaching of Koritzinsky-Wood-Misra-Rabe in order to quickly identify specific connectivity problems for network management purpose.

6. Claims 14-18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Koritzinsky, U.S. Pat. No. 6,494,831 in view of Misra, U.S. Pat. No. 7,162,250 and further in view of Rabe et al (Hereafter, Rabe), U.S. Pat. No. 7,194,538.

Regarding claim 14, Koritzinsky teaches a method of performing a network connectivity verification in a network management context comprising steps of performing scheduled connectivity verification (= verifying network connectivity between a diagnostic system and a remote service facility) [see Abstract and Figs. 1-5 and Col. 12, Lines 13-29] and generating alerts in response to problems with connectivity [see Col. 6, Line 66 to Col. 7, Line 34 and Col. 7, Line 62 to Col. 8, Line 30]. Koritzinsky does not explicitly teach comparing a connectivity verification result with a threshold, said connectivity verification threshold specified by a user.

However, Misra, in the same field of monitoring network nodes connectivity endeavor, discloses obtaining performance metrics and comparing against configured thresholds [see Fig. 6, step 601]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of obtaining performance metrics and comparing against configured thresholds of Misra into the teaching of generating alerts in response to problems with connectivity of Koritzinsky in order to efficiently keep track of network connectivity information and identify specific connectivity problems for network management purpose so that the problems can be quickly resolved.

Moreover, Koritzinsky further teaches IP address related to connectivity problems or failures as one of example of layer-2/layer-3 object related to an alarm/alert in the

network [see Koritzinsky, Col. 11, Lines 8-40]. Koritzinsky-Misra do not explicitly teach highlighting objects affected by alarm/alert. However, Rabe, in the same field of monitoring network nodes connectivity endeavor, discloses highlighting objects that have active alerts [see Rabe, Col. 6, Lines 4-30]. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of Rabe into the teaching of Koritzinsky-Misra in order to efficiently keep track of network connectivity information and quickly identify alerting condition for network management purpose.

Regarding claim 15, Koritzinsky further teaches the method of performing a network connectivity verification claimed in claim 14, further comprising a step of: storing connectivity verification job on computer readable medium for subsequent access and execution [see Col. 6, Line 66 to Col. 7, Line 34 and Col. 7, Line 62 to Col. 8, Line 30].

Regarding claims 16-17, Koritzinsky further teaches the method of performing a network connectivity verification claimed in claim 14, further comprising a step of: highlighting at least one IP object based on one of a connectivity verification job and a connectivity verification result and wherein a highlighted object is one of an OSI Layer 2 and OSI Layer 3 object [see Col. 6, Lines 13-34 and Col. 11, Lines 8-40].

Regarding claim 18, Koritzinsky further teaches the method of performing a network connectivity verification claimed in claim 14, wherein performing scheduled connectivity verification the method further comprising a step of: periodically executing connectivity verification tests [see Col. 12, Lines 13-31].

Regarding claim 20, Koritzinsky further teaches the method of performing a network connectivity verification claimed in claim 14, further comprising a step of: storing historical connectivity verification results on computer readable medium for subsequent access [see Col. 6, Line 66 to Col. 7, Line 34 and Col. 7, Line 62 to Col. 8, Line 30].

7. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Koritzinsky, U.S. Pat. No. 6,494,831 in view of Misra, U.S. Pat. No. 7,162,250 and further in view of Rabe et al (Hereafter, Rabe), U.S. Pat. No. 7,194,538 and further in view of admitted prior art (APA) [the background of instant application's specification].

Regarding claim 19, Koritzinsky-Misra-Rabe do not explicitly teach the method of performing a network connectivity verification claimed in claim 14, wherein performing scheduled connectivity verification the method further comprising a step of: issuing a one of a ping command and traceroute command.

However, the admitted prior art (APA) in the background of the instant application's specification discloses verifying connectivity between individual routers including pining/tracerout test [see APA, Paragraphs 0014 & 0021-0022]. It would have

been obvious to one of ordinary skill in the art at the time of the invention was made to incorporate the teaching of APA into the teaching of Koritzinsky-Misra-Rabe in order to quickly identify specific connectivity problems for network management purpose.

8. A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS ACTION IS SET TO EXPIRE THREE MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION. FAILURE TO RESPOND WITHIN THE PERIOD FOR RESPONSE WILL CAUSE THE APPLICATION TO BECOME ABANDONED (35 U.S.C. § 133). EXTENSIONS OF TIME MAY BE OBTAINED UNDER THE PROVISIONS OF 37 CAR 1.136(A).

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Philip Tran whose telephone number is (571) 272-3991. The Group fax phone number is (571) 273-8300. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Saleh Najjar, can be reached on (571) 272-4006.

10. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Philip B Tran/
Primary Examiner, Art Unit 2155
June 22, 2008

Notice of References Cited	Application/Control No. 10/820,111	Applicant(s)/Patent Under Reexamination PROULX ET AL.	
	Examiner Philip B. Tran	Art Unit 2155	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-7,194,538	03-2007	Rabe et al.	709/224
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No. 10820111	Applicant(s)/Patent Under Reexamination PROULX ET AL.
	Examiner Tran, Philip B	Art Unit 2155

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/11/2007	04/11/2008	06/22/2008						
	1	✓	✓	✓						
	2	✓	✓	✓						
	3	✓	✓	✓						
	4	✓	✓	✓						
	5	✓	✓	✓						
	6	✓	✓	✓						
	7	✓	✓	✓						
	8	✓	-	-						
	9	✓	✓	✓						
	10	✓	✓	✓						
	11	✓	✓	✓						
	12	✓	✓	✓						
	13	✓	✓	✓						
	14	✓	✓	✓						
	15	✓	✓	✓						
	16	✓	✓	✓						
	17	✓	✓	✓						
	18	✓	✓	✓						
	19	✓	✓	✓						
	20	✓	✓	✓						

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10820111	PROULX ET AL.
	Examiner	**Art Unit**
	Tran, Philip B	2155

SEARCHED

Class	Subclass	Date	Examiner
709	220, 223, 224	9/11/2007	PBT
Updated	Search	4/11/2008	PBT
Updated	Search	6/22/08	PBT

SEARCH NOTES

Search Notes	Date	Examiner
East and NPL	9/11/2007	PBT
Updated Search	4/11/2008	PBT
Updated Search	6/22/08	PBT

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner

Electronic Acknowledgement Receipt

EFS ID:	3959286
Application Number:	10820111
International Application Number:	
Confirmation Number:	8431
Title of Invention:	Centralized internet protocol/multi-protocol label switching connectivity verification in a communications network management context
First Named Inventor/Applicant Name:	Denis Armand Proulx
Correspondence Address:	KRAMER & AMADO, P.C. - Suite 240 1725 Duke Street Alexandria VA 22314 US 7035199801 -
Filer:	Terry Wayne Kramer/Wanda Ricks
Filer Authorized By:	Terry Wayne Kramer
Attorney Docket Number:	ALC 3125
Receipt Date:	17-SEP-2008
Filing Date:	08-APR-2004
Time Stamp:	16:17:20
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		ALC3125AMEND2.pdf	3795233 826ae113b0ad5ff85d60c6039d823dfe5633c042	yes	17

Multipart Description/PDF files in .zip description		
Document Description	**Start**	**End**
Amendment/Req. Reconsideration-After Non-Final Reject	1	1
Claims	2	9
Applicant Arguments/Remarks Made in an Amendment	10	17

Warnings:

Information:

Total Files Size (in bytes):	3795233

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 10/820,111	Filing Date 04/08/2004	☐ To be Mailed

APPLICATION AS FILED – PART I

FOR	NUMBER FILED (Column 1)	NUMBER EXTRA (Column 2)	SMALL ENTITY ☐ RATE ($)	FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							
			TOTAL			TOTAL	

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED – PART II

AMENDMENT	09/17/2008	CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 19	Minus	** 20	= 0	X $ =		OR	X $50=	0
	Independent (37 CFR 1.16(h))	* 3	Minus	***3	= 0	X $ =		OR	X $210=	0
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	0

AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT (Column 1)		HIGHEST NUMBER PREVIOUSLY PAID FOR (Column 2)	PRESENT EXTRA (Column 3)	RATE ($)	ADDITIONAL FEE ($)		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))									
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

Legal Instrument Examiner:
/LAVINIA JOHNSON/

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of	:	Denis Armand Proulx et al.
For	:	CENTRALIZED INTERNET PROTOCOL/MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT
Serial No.:	:	10/820,111
Filed	:	April 8, 2004
Art Unit	:	2155
Examiner	:	Philip B. Tran
Att. Docket	:	ALC 3125
Confirmation No.	:	8431

AMENDMENT UNDER 37 C.F.R § 1.111

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action mailed on June 24, 2008, Applicant respectfully submits the following amendments for form, and requests reconsideration and withdrawal of all rejections for the reasons stated at the Remarks section of this paper.

A Listing of the claims begins at page 2 of this paper.

Remarks begin at page 10 of this paper.

Application No: 10/820,111
Attorney's Docket No: ALC 3125

CLAIM AMENDMENTS

This listing of claims replaces all prior versions and listings of claims in the application.

Listing of the Claims:

1. (Currently Amended) A network management connectivity verification framework comprising:

a connectivity verification server to perform ~~that performs~~ unattended connectivity verification jobs; and

a connectivity verification application ~~for~~ to:

~~defining~~ define connectivity verification jobs capable of verifying connectivity in the network relating to at least Layer-2 and Layer 3 objects within a given containment hierarchy for the network,

~~configuring~~ control the connectivity verification server to perform the defined connectivity verification jobs, wherein the performing generates at least one connectivity result ~~accordingly~~,

~~displaying~~ display the connectivity verification results,

receive a user-input specification of ~~specifying, by a user,~~ at least one connectivity verification threshold ~~for comparison to the connectivity verification results~~; ~~and~~

compare the connectivity verification results to the specified connectivity verification thresholds,

generate an alarm when the comparison shows that at least one of the connectivity verification results has reached the specified connectivity verification threshold,

identify Layer-2 and Layer-3 objects within the containment hierarchy affected by the verification results associated with the alarm, and

display the identified ~~displaying and highlighting~~ Layer-2 and Layer-3 objects~~affected by an alarm~~.

2. (Currently Amended) ~~A~~ The connectivity verification framework ~~claimed in~~ of claim 1, wherein the connectivity verification jobs are scheduled and the connectivity verification server performs scheduled connectivity verification.

3. (Currently Amended) ~~A~~ The connectivity verification framework ~~claimed in~~ of claim 1, wherein the connectivity verification application further provides a display of connectivity verification results.

4. (Currently Amended) ~~A~~ The connectivity verification framework ~~claimed in~~ of claim 1, wherein the results of each connectivity verification job may be compared against a connectivity profile, a deviation from the connectivity profile being used to raise an alarm.

5. (Currently Amended) ~~A~~ The connectivity verification framework ~~claimed in~~ of claim 3,

wherein the connectivity verification results, including alarm information, are further used to generate a network map displaying selected connectivity verification results.

6. (Currently Amended) A method of creating a network connectivity verification test, comprising the following steps ~~of~~:

defining a connectivity verification job capable of verifying connectivity in the network relating to at least Layer-2 and Layer 3 objects within a given containment hierarchy for the network;

controlling ~~configuring~~ a connectivity verification server to perform the connectivity verification job wherein the performing generates at least one connectivity result;

displaying the connectivity verification results;

receiving a user-input specification of ~~specifying, by a user,~~ at least one connectivity verification threshold ~~for comparison to the connectivity verification results~~; ~~and~~

comparing the connectivity verification results to the specified connectivity verification threshold;

generating an alarm when the comparison shows that at least one of the connectivity verification results has reached the specified connectivity verification threshold;

identifying Layer-2 and Layer-3 objects within the containment hierarchy affected by the verification results associated with the alarm; and

displaying the identified ~~displaying and highlighting~~ Layer-2 and Layer-3 objects ~~affected by an alarm~~.

7. (Currently Amended) The method of creating ~~a~~ the network connectivity verification test ~~claimed in~~ of claim 6, wherein defining the connectivity verification job further comprises the following steps ~~of~~:

selecting via an NMS user interface, a pair of source and destination IP objects between which connectivity is to be verified; and

specifying a connectivity verification schedule.

8. (Canceled).

9. (Currently Amended) The method of creating ~~a~~ the network connectivity verification test ~~claimed in~~ of claim 6, wherein the step of receiving a user-input specification ~~specifying the at least one connectivity verification threshold~~ further comprises the step of specifying a threshold for at least one of round trip delay, jitter, and packet loss.

10. (Currently Amended) The method of creating ~~a~~ the network connectivity verification test ~~claimed in~~ of claim 7,

wherein the step of selecting IP objects selects IP objects from a group comprising ~~a selected IP object include one~~ at least one of a router, an IP interface, and an IP address.

11. (Currently Amended) The method of creating ~~a~~ the network connectivity verification test ~~claimed in~~ of claim 7,

wherein the step of selecting IP objects selects pairs of IP objects from a group comprising ~~the pair of IP objects is selected selecting~~ at least one of an ~~IP~~ Internet Protocol (IP) link, ~~an LSP~~ a Label Switched Path (LSP), and a ~~VPN~~ Virtual Private Network (VPN).

12. (Currently Amended) The method of creating ~~a~~ the network connectivity verification test ~~claimed in~~ of claim 6,

wherein the step of defining the connectivity verification job further comprises ~~a step of~~ the following step:

configuring a connectivity verification parameter ~~including~~ from a group comprising at least one of a number of ping commands to issue, a ping packet size, a ping data fill pattern, a time to wait for response, and a type of service.

13. (Currently Amended) The method of creating ~~a~~ the network connectivity verification test ~~claimed in~~ of claim 6,

wherein the step of defining the connectivity verification job further comprises ~~a step of~~ the following step:

configuring a connectivity verification parameter ~~including~~ from a group comprising at least one of a number of traceroute commands to issue, a traceroute packet size, a traceroute packet data fill pattern, a time to wait for response, and a type of service.

14. (Currently Amended) A method of performing a network connectivity verification test in a network management context comprising the following steps~~-of~~:

scheduling a connectivity verification process, the process capable of verifying connectivity in the network relating to at least Layer-2 and Layer 3 objects within a given containment hierarchy for the network;

receiving a user-input specification of at least one verification threshold;

performing the scheduled connectivity verification to generate a connectivity verification result;

comparing a connectivity verification result with the user-specified~~a~~ connectivity verification threshold~~, said the connectivity verification threshold specified by a user~~;

generating ~~raising~~ an alarm ~~if~~ when the comparison shows that the connectivity verification result has reached the specified connectivity verification threshold; ~~and~~

identifying Layer-2 and Layer-3 objects within the containment hierarchy affected by the verification results associated with the alarm; and

displaying the identified ~~displaying and highlighting~~ Layer-2 and Layer-3 objects~~affected by an alarm~~.

15. (Currently Amended) The method of performing ~~a~~ the network connectivity verification test ~~claimed in~~ of claim 14, further comprising ~~a step of~~ the following step:

storing a connectivity verification job on a computer readable medium for subsequent access and execution.

16. (Currently Amended) The method of performing ~~a~~ the network connectivity verification test ~~claimed in~~ of claim 14, further comprising ~~a step of~~ the following step:

highlighting ~~highlighting~~ displaying at least one IP object based on one of a connectivity verification job and a connectivity verification result.

17. (Currently Amended) The method of performing ~~a~~ the network connectivity verification test ~~claimed in~~ of claim 16,

wherein ~~a highlighted~~ the displayed object is one of an OSI Layer 2 and an OSI Layer 3 object.

18. (Currently Amended) The method of performing ~~a~~ the network connectivity verification test ~~claimed in~~ of claim 14,

wherein the step of performing scheduled connectivity verification further comprises ~~a step of~~ the following step:

periodically executing connectivity verification tests.

19. (Currently Amended) The method of performing ~~a~~ the network connectivity verification test ~~claimed in~~ of claim 14,

wherein the step of performing scheduled connectivity verification further comprises ~~a step of~~ the following step:

issuing at least one of a ping command and a traceroute command.

20. (Currently Amended) The method of performing ~~a~~ the network connectivity verification test ~~claimed in~~ of claim 14, further comprising ~~a step of~~ the following step:

storing historical connectivity verification results on a computer readable medium for subsequent access.

REMARKS/ARGUMENTS

Claims 1-7 and 9-20 are pending in the present application. Claims 1, 6, and 14 are independent. Claims 1-7 and 9-20 are amended.

Rejections Under 35 U.S.C. § 112

In section 2 on page 2, the Office Action rejects claims 1 and 6 under 35 U.S.C. § 112, second paragraph, as allegedly indefinite. Specifically, the Examiner alleges that "it is unclear when an alarm is occurred" in both claims. Applicant respectfully traverses this rejection.

Applicant respectfully submits that reading the as-examined claims 1 and 6, in their entirety, a person of ordinary skill in the art would clearly understand the alarm to be generated as a result of the recited connectivity thresholds not being met. However, for purposes of simplifying issues to expedite examination, and without waiving the traversal, Applicant respectfully amends the form of claims 1 and 6 to positively recite the generation of the alarm. Applicant respectfully refers the Examiner to lines 15-16 of claim 1 and lines 11-12 of claim 6, as currently amended. Therefore, Applicant respectfully requests withdrawal of the rejection of claims 1 and 6 under 35 U.S.C. § 112, second paragraph.

Rejections Under 35 U.S.C. § 103

In section 3 on pages 2-8, the Office Action rejects claims 1-7 and 9-11 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,494,831 to Koritzinsky (hereinafter "Koritzinsky") in view of U.S. Patent No. 6,405,248 to Wood (hereinafter "Wood"),

further in view of U.S. Patent No. 7,162,250 to Misra (hereinafter "Misra") and U.S. Patent No. 7,194,538 to Rabe (hereinafter "Rabe").

In section 5 on page 9, the Office Action rejects dependent claims 12 and 13 as allegedly being unpatentable over Koritzinsky, Wood, Misra, and Rabe further in view of Admitted Prior Art (hereinafter "APA").

In section 6 on pages 10-12, the Office Action rejects claims 14-18 and 20 as allegedly being unpatentable over Koritzinsky, Misra, and Rabe. In section 7 on pages 12-13, the Office Action rejects claim 19 as allegedly being unpatentable over Koritzinsky, Misra, Rabe, and APA.

Applicant respectfully traverses all of these rejections for the reasons listed below.

Exemplary elements of the invention defined by the examined claims 1, 6, and 14 include performing a connectivity verification capable of generating a connectivity verification, comparing the connectivity verification results to a user-specified threshold, generating an alarm when the comparison shows that the connectivity verification result has reached the specified threshold, and, in response, identifying Layer-2 and Layer-3 objects affected by the connectivity verification alarm, and displaying the identified Layer-2 and Layer-3 objects.

The combined references lack performing any test having any alarm generation, or any comparison with any thresholds, that indicates Layer 2 and Layer 3 objects are affected by a condition for which the alarm was generated.

For purposes of expediting examination by simplifying issues, and without any disclaimer of claim scope or subject matter, Applicant respectfully amends the form of base claims 1, 6, and 14 to positively recite the verification test being capable, as is necessarily

included in a proper interpretation of the examined claims 1, 6, and 14, of detecting connectivity in terms of Layer 2 and Layer 3 objects of the network. Applicant respectfully refers the Examiner to lines 6-7 of claim 1 and lines 3-4 of claims 6 and 14, as currently amended.

Further, and also for purposes of expediting examination by simplifying issues, and without any disclaimer of claim scope or subject matter, Applicant respectfully amends the form of base claims 1, 6, and 14 to positively recite the Layer 2 and Layer 3 objects of the network according to their plain meaning, namely, the Layer 2 and Layer 3 objects being defined by a given containment hierarchy for the network. Applicant respectfully refers the Examiner to lines 7-8 of claim 1 and lines 4-5 of claims 6 and 14, as currently amended.

Enabling and descriptive support for all of the amended recital appears throughout Applicant's originally filed specification, drawings and original claims including, but not limited to, FIG. 5, paragraphs [47] – [56] , and original claims 1, 6, and 14.

Applicant's base claims 1, 6, and 14 further recite comparing the verification test results to the user-specified thresholds, generating an alarm, and based on the alarm and the containment hierarchy, identifying the Layer-2 and Layer-3 objects affected by the connectivity verification results associated with the alarm. See lines 7-8 of claim 1 and lines 4-5 of claims 6 and 14, as currently amended.

Enabling and descriptive support for all of the amended recital appears throughout Applicant's originally filed specification, drawings and original claims including, but not limited to, FIG. 5, paragraphs [47] – [56] , and original claims 1, 6, and 14.

Applicant respectfully submits that upon properly interpreting claims 1, 6, and 14 by applying the broadest reasonable meaning to their claim language, and identifying the differences between these interpreted claims and the scope and content of the prior art as evidenced by the collected teachings of Koritzinsky, Misra, Rabe, and Wood, that the claims are patentable within the meaning of 35 U.S.C. § 103.

On page 4 of the Office Action, the Examiner correctly concedes that "Koritzinsky-Wood-Misra do not explicitly teach highlighting objects affected by alarm/alert."

Applicant submits, in addition, that the combination of Koritzinsky-Wood-Misra also fails to disclose, teach, or suggest the subject matter of claims 1, 6, and 14 of defining or performing a verification test capable of detecting connectivity in terms of Layer 2 and Layer 3 objects of the network.

Applicant further submits that the combination of Koritzinsky-Wood-Misra also fails to disclose, teach, or suggest the subject matter of claims 1, 6, and 14 of raising an alarm when the comparison shows that at least one of the connectivity verification results has reached the specified connectivity verification threshold, as recited in independent claims 1, 6, and 14.

The Examiner takes the position that this deficiency of the Koritzinsky-Wood-Misra combination is remedied by adding the Examiner's characterization of a passage extracted from Rabe, which is that Rabe "discloses highlighting objects that have active alerts" on lines 4-30 of col. 6. Applicant respectfully submits, in response, that col. 6 of Rabe discloses no information regarding such alerts.

Applicant respectfully notes that another part of Rabe, namely lines 17-18 of col. 46, does disclose displaying "historical alert reports" in tabular form and "alert summary reports" in graphical form. However, this teaching in Rabe has nothing to do with, and suggests nothing regarding raising an alarm based upon a "specified connectivity verification threshold," as recited in independent claims 1, 6, and 14. Thus, Rabe fails to remedy the lack of a teaching of alarms within Koritzinsky, Wood, Misra, and the allegedly Admitted Prior Art.

On page 6 of the Office Action, the Examiner correctly concedes that Koritzinsky "does not explicitly teach [sic] the results of each connectivity verification job may be compared against a connectivity profile." The Examiner then takes the position that Misra "discloses obtaining performance metrics and comparing against configured thresholds." Applicant respectfully submits that the Examiner's position is inconsistent with the plain meaning of the claim language, and/or is not supported by the Misra disclosure.

Applicant submits the Examiner appears to interpret the claims as covering the abstract concept of comparing a parameter to a threshold to generate a result. This is not consistent with the claim language.

The as-examined claims 1, 6, and 14 instead defined, and the presently amended claims 1, 6, and 14 now more positively recite, performing connection verification tests pertaining to Layer 2 and Layer 3 objects, comparing the results to user-specified thresholds, generating alarms based on the comparing and, in response, identifying which Layer 2 and Layer 3 objects are affected by the connection verification results associated with the comparing.

Applicant respectfully submits that the rejection misconstrues Misra, as it cites Misra as suggesting subject matter that, upon reading Misra in its entirety, is not found in the disclosure.

Misra teaches a method and system for load balancing for packet-based wireless cellular networks. Misra teaches, more specifically, varying the "footprint" [col. 4, line 34] of a collection of access points (APs) to balance the load. Misra suggests nothing of performing connectivity verification for links or of comparing connectivity verification results to specified connectivity verification thresholds in a manner to ascertain which link may be affected.

Further, Applicant respectfully submits that the references cited by the Examiner do not disclose connectivity verification results that can be compared with thresholds.

For example, the Examiner concedes on page 4 that "Koritzinsky does no explicitly teach displaying connectivity verification results." However, the Examiner then alleges that Wood discloses collecting connectivity information and displaying the network topology information. Applicant respectfully submits that the Examiner's position is not supported by the Wood disclosure. Applicant respectfully submits that Wood's teaching of network topology information cannot be regarded, by a person of ordinary skill in the relevant art, as a teaching of a connectivity verification result as recited by claims 1, 6, and 14. Further, Wood discloses nothing that could be reasonably understood by a person or ordinary skill in the relevant art as suggesting a comparison with a specified connectivity verification threshold as recited by claims 1, 6, and 14.

Moreover, Applicant respectfully submits that the Office Action lacks a clear articulation of the reasons why, in view of the cited prior art, the claimed invention would have been

obvious, as set forth in M.P.E.P. § 2142. The Supreme Court in *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727 (2007) noted that the analysis supporting a rejection under 35 U.S.C. § 103 should be made explicit. Moreover, the Federal Circuit has stated that "rejections on obviousness cannot be sustained with mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006).

Thus, Applicant respectfully submits that Koritzinsky, Wood, Misra, Rabe, and the allegedly Admitted Prior Art from Applicant's specification fail to disclose, teach, or suggest raising an alarm based upon a "specified connectivity verification threshold," as recited in independent claims 1, 6, and 14.

Applicant respectfully submits that claims 2-5 are allowable based at least upon their dependence from claim 1 for the reasons stated above in connection with claim 1. Applicant respectfully submits that claims 7 and 9-13 are allowable based at least upon their dependence from claim 6 for the reasons stated above in connection with claim 6. Applicant respectfully submits that claims 15-20 are allowable based at least on their dependence from claim 14 for the reasons stated above in connection with claim 14.

For at least the forgoing reasons, Applicant respectfully requests that the rejection of claims 1-7 and 8-20 under 35 U.S.C. § 103 be withdrawn.

Conclusion

While we believe that the instant amendment places the application in condition for allowance, should the Examiner have any further comments or suggestions, it is respectfully requested that the Examiner telephone the undersigned attorney in order to expeditiously resolve any outstanding issues.

In the event that the fees submitted prove to be insufficient in connection with the filing of this paper, please charge our Deposit Account Number 50-0578 and please credit any excess fees to such Deposit Account.

Respectfully submitted,
KRAMER & AMADO, P.C.

Terry W. Kramer

Date: September 15, 2008

Terry W. Kramer
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NOTICE OF ALLOWANCE AND FEE(S) DUE

7590 10/02/2008

KRAMER & AMADO, P.C.
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EXAMINER	
TRAN, PHILIP B	
ART UNIT	PAPER NUMBER
2155	

DATE MAILED: 10/02/2008

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,111	04/08/2004	Denis Armand Proulx	ALC 3125	8431

TITLE OF INVENTION: CENTRALIZED INTERNET PROTOCOL/MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	01/02/2009

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

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B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

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Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
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INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

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7590 10/02/2008

KRAMER & AMADO, P.C.
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(Depositor's name)

(Signature)

(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,111	04/08/2004	Denis Armand Proulx	ALC 3125	8431

TITLE OF INVENTION: CENTRALIZED INTERNET PROTOCOL/MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	01/02/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
TRAN, PHILIP B	2155	709-224000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 ____________________

2 ____________________

3 ____________________

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:

❑ Issue Fee

❑ Publication Fee (No small entity discount permitted)

❑ Advance Order - # of Copies ____________________

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**

❑ A check is enclosed.

❑ Payment by credit card. Form PTO-2038 is attached.

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number ____________ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)

❑ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.

❑ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature ______________________________ Date ______________________________

Typed or printed name ______________________________ Registration No. ______________________________

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,111	04/08/2004	Denis Armand Proulx	ALC 3125	8431

7590 10/02/2008

KRAMER & AMADO, P.C.
Suite 240
1725 Duke Street
Alexandria, VA 22314

EXAMINER	
TRAN, PHILIP B	
ART UNIT	PAPER NUMBER
2155	

DATE MAILED: 10/02/2008

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)

(application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 838 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 838 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

PTOL-85 (Rev. 08/07) Approved for use through 08/31/2010.

Notice of Allowability	Application No. 10/820,111	Applicant(s) PROULX ET AL.
	Examiner Philip B. Tran	Art Unit 2155

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *9/17/2008*.
2. ☒ The allowed claim(s) is/are *1-7 and 9-20 (renumbered as claims 1-19)*.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☒ All b) ☐ Some* c) ☐ None of the:
   1. ☒ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
   1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date *attached* .
7. ☒ Examiner's Amendment/Comment
8. ☐ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

/Philip B Tran/
Primary Examiner, Art Unit 2155

Interview Summary	Application No. 10/820,111	Applicant(s) PROULX ET AL.
	Examiner Philip B. Tran	Art Unit 2155

All participants (applicant, applicant's representative, PTO personnel):

(1) *Philip B. Tran - Primary Examiner*. (3)_____.

(2) *Terry W. Kramer (Reg. No. 41,541)*. (4)_____.

Date of Interview: *26 September 2008*.

Type: a)☒ Telephonic b)☐ Video Conference
c)☐ Personal [copy given to: 1)☐ applicant 2)☐ applicant's representative]

Exhibit shown or demonstration conducted: d)☐ Yes e)☒ No.
If Yes, brief description: _____.

Claim(s) discussed: *1-7 and 9-20*.

Identification of prior art discussed: *N/A*.

Agreement with respect to the claims f)☒ was reached. g)☐ was not reached. h)☐ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: *Claims 1, 3, 4, 6, 14 and 16 have been amended (see Examiner's Amendment)*.

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN A NON-EXTENDABLE PERIOD OF THE LONGER OF ONE MONTH OR THIRTY DAYS FROM THIS INTERVIEW DATE, OR THE MAILING DATE OF THIS INTERVIEW SUMMARY FORM, WHICHEVER IS LATER, TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.

/Philip B Tran/
Primary Examiner, Art Unit 2155

EXAMINER'S AMENDMENT

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

2. Authorization for this examiner's amendment was given in a telephone interview with Mr. Kramer (Reg. No. 41,541), the undersigned, on September 26, 2008.

3. The application has been amended as follows:

IN THE CLAIMS:

The claims of the invention have been amended as follows:

1. (Currently Amended) A network management connectivity verification framework comprising:

a connectivity verification server to perform unattended connectivity verification jobs; and

a connectivity verification application to:

define connectivity verification jobs capable of verifying connectivity in the network relating to at least Layer-2 and Layer-3 objects within a given containment hierarchy for the network,

control the connectivity verification server to perform the defined connectivity verification jobs, wherein the performing generates at least one **<u>of</u>** connectivity **<u>verification</u>** result**<u>s</u>**,

display the connectivity verification results,

receive a user-input specification of ~~at least one~~ **<u>a</u>** connectivity verification threshold [[;]] **<u>,</u>**

compare the connectivity verification results to the specified connectivity verification ~~thresholds~~ threshold,

generate an alarm when the comparison shows that at least one of the connectivity verification results has reached the specified connectivity verification threshold,

identify Layer-2 and Layer-3 objects within the containment hierarchy affected by the **<u>connectivity</u>** verification results associated with the alarm, and

display the identified Layer-2 and Layer-3 objects.

3. (Currently Amended) The connectivity verification framework of claim 1, wherein the connectivity verification application further provides a display of **<u>the</u>** connectivity verification results.

4. (Currently Amended) The connectivity verification framework of claim 1, wherein the results of each connectivity verification job ~~may be~~ **are** compared against a connectivity profile, a deviation from the connectivity profile being used to raise [[an]] **the** alarm.

6. (Currently Amended) A method **implemented at least in part by a connectivity verification server for** [[of]] creating a network connectivity verification test, comprising the following steps:

defining a connectivity verification job capable of verifying connectivity in the network relating to at least Layer-2 and Layer 3 objects within a given containment hierarchy for the network;

controlling [[a]] **the** connectivity verification server to perform the connectivity verification job wherein the performing generates at least one **of** connectivity **verification** result**s**;

displaying the connectivity verification results;

receiving a user-input specification of ~~at least one~~ **a** connectivity verification threshold;

comparing the connectivity verification results to the specified connectivity verification threshold;

generating an alarm when the comparison shows that at least one of the connectivity verification results has reached the specified connectivity verification threshold;

identifying Layer-2 and Layer-3 objects within the containment hierarchy affected by the **connectivity** verification results associated with the alarm; and

displaying the identified Layer-2 and Layer-3 objects.

14. (Currently Amended) A method **implemented at least in part by a connectivity verification server for** [[of]] performing a network connectivity verification test in a network management context comprising the following steps:

scheduling a connectivity verification process, the process capable of verifying connectivity in the network relating to at least Layer-2 and Layer-3 objects within a given containment hierarchy for the network;

receiving a user-input specification of ~~at least one~~ **a connectivity** verification threshold;

performing the scheduled connectivity verification **process** to generate a connectivity verification result;

comparing [[a]] **the** connectivity verification result with the user-specified connectivity verification threshold;

generating an alarm when the comparison shows that the connectivity verification result has reached the specified connectivity verification threshold;

identifying Layer-2 and Layer-3 objects within the containment hierarchy affected by the **connectivity** verification ~~results~~ **result** associated with the alarm; and

displaying the identified Layer-2 and Layer-3 objects.

16. (Currently Amended) The method of performing the network connectivity verification test of claim [[14]] **15**, further comprising the following step:

displaying at least one IP object based on one of [[a]] **the** connectivity verification job and [[a]] **the** connectivity verification result.

ALLOWABLE SUBJECT MATTER

4. Claims 1-7 and 9-20 (renumbered as claims 1-19) are allowable over the prior art of record.

5. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

6. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Philip B. Tran whose telephone number is (571) 272-3991. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

8. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Philip B Tran/
Primary Examiner, Art Unit 2155
Sept 26, 2008

Index of Claims	Application/Control No. 10820111	Applicant(s)/Patent Under Reexamination PROULX ET AL.
	Examiner Philip B Tran	Art Unit 2155

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/11/2007	04/11/2008	06/22/2008	09/26/2008					
1	1	✓	✓	✓	=					
2	2	✓	✓	✓	=					
3	3	✓	✓	✓	=					
5	4	✓	✓	✓	=					
4	5	✓	✓	✓	=					
6	6	✓	✓	✓	=					
7	7	✓	✓	✓	=					
	8	✓	-	-	-					
10	9	✓	✓	✓	=					
8	10	✓	✓	✓	=					
9	11	✓	✓	✓	=					
11	12	✓	✓	✓	=					
12	13	✓	✓	✓	=					
13	14	✓	✓	✓	=					
14	15	✓	✓	✓	=					
15	16	✓	✓	✓	=					
16	17	✓	✓	✓	=					
17	18	✓	✓	✓	=					
18	19	✓	✓	✓	=					
19	20	✓	✓	✓	=					

Issue Classification

Application/Control No.	Applicant(s)/Patent Under Reexamination
10820111	PROULX ET AL.
Examiner	**Art Unit**
Philip B Tran	2155

ORIGINAL

CLASS	SUBCLASS
709	224

INTERNATIONAL CLASSIFICATION

CLAIMED					NON-CLAIMED
G	0	6	F	15 / 173 (2006.0)	

CROSS REFERENCE(S)

CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
709	223	220			

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	16	17												
2	2	17	18												
3	3	18	19												
5	4	19	20												
4	5														
6	6														
7	7														
	8														
10	9														
8	10														
9	11														
11	12														
12	13														
13	14														
14	15														
15	16														

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 19	
/Philip B Tran/ Primary Examiner.Art Unit 2155 (Primary Examiner)	9/26/2008 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 51

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	10820111	PROULX ET AL.
	Examiner	**Art Unit**
	Tran, Philip B	2155

SEARCHED

Class	Subclass	Date	Examiner
709	220, 223, 224	9/11/2007	PBT
Updated	Search	4/11/2008	PBT
Updated	Search	6/22/08	PBT
Updated	Search	9/26/08	PBT

SEARCH NOTES

Search Notes	Date	Examiner
East and NPL	9/11/2007	PBT
Updated Search	4/11/2008	PBT
Updated Search	6/22/08	PBT
Updated Search	9/26/08	PBT

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner
709	224, 223, 220	9/26/08	PBT

EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	16	(proulx near2 denis).inv.	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:02
L2	16157	alcatel.as.	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:03
L3	22	(connectivity near2 verification) and 2	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:05
L4	2	(connectivity near2 verification) and 1	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:05
L5	1	"6816462".pn.	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:06
L6	13199	(connect$5 link$5 path$5 tunnel$5 channel$5) near2 verif$7	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:10
L7	705	6 same (alarm$5 alert$5 notif$7)	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:11
L8	35	7 same threshold	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:16
L9	280127	(connect$5 link$5 path$5 tunnel$5 channel$5) near2 (verif$7 teast$5 monitor$5 confirm$5 determin$5 check$5)	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:17
L10	13362	9 same (alarm$5 alert$5 notif$7)	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:17

L11	944	10 same threshold	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:18
L12	17	11 same network same server	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:20
L13	0	11 same VNN	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:20
L14	10	11 same VPN	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:20
L15	8	8 same VPN	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:20
L16	9	8 and VPN	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:21
L17	37	11 and VPN	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:21
L18	3	11 same framework	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:22
L19	0	11 same (layer-2 layer-3)	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:23
L20	4	11 and (layer-2 layer-3)	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:23
L21	0	"709"/$.09/$.ccls.	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:30
L22	67704	"709"/$.ccls.	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:30

L23	7965	709/224.ccls.	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:31
L24	7795	709/223.ccls.	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:31
L25	3378	709/220.ccls.	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:31
L26	47	11 and 22	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:33
L27	14	11 and 23	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:33
L28	8	11 and 24	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:33
L29	3	11 and 25	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:33
L30	553	10 same network same server	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:34
L31	191	30 and 22	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:34
L32	48	30 and 23	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:35
L33	29	30 and 24	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:35
L34	9	30 and 25	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:35

L35	6	8 and @ad<"20030415"	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:36
L36	5	12 and @ad<"20030415"	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:36
L37	6	17 and @ad<"20030415"	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:37
L38	32	26 and @ad<"20030415"	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:37
L39	9	27 and @ad<"20030415"	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:37
L40	5	28 and @ad<"20030415"	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:37
L41	3	29 and @ad<"20030415"	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:38
L42	101	31 and @ad<"20030415"	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:38
L43	28	32 and @ad<"20030415"	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:38
L44	17	33 and @ad<"20030415"	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:38
L45	6	34 and @ad<"20030415"	US-PGPUB; USPAT; EPO	OR	ON	2008/09/26 18:38

9/26/08 6:39:53 PM
C:\ Documents and Settings\ PTran3\ My Documents\ EAST\ Workspaces\ 11613799a.wsp

12/22/2008 10:48 A-L DOCKET ADMIN → 915712732885 NO.856 P01

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

7590 10/02/2008

KRAMER & AMADO, P.C.
Suite 240
1725 Duke Street
Alexandria, VA 22314

OIPE DEC 2 2 2008 PATENT & TRADEMARK OFFICE

12/22/2008 WASFAW2 00000108 122325 10820111

01 FC:1501 1510.00 DA
02 FC:1504 300.00 DA

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of [redacted] Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

Patty Giebler (Depositor's name)
Patty Giebler (Signature)
12-22-08 (Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,111	04/08/2004	Denis Armand Proulx	ALC 3125	8431

TITLE OF INVENTION: CENTRALIZED INTERNET PROTOCOL/MULTI-PROTOCOL LABEL SWITCHING CONNECTIVITY VERIFICATION IN A COMMUNICATIONS NETWORK MANAGEMENT CONTEXT

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	$1510	$300	$0	$1810	01/02/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
TRAN, PHILIP B	2155	709-224000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.

2. For printing on the patent front page, list

(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 ____
2 ____
3 ____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: ALCATEL LUCENT

(B) RESIDENCE: (CITY and STATE OR COUNTRY): Paris, France

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☒ Issue Fee
☒ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies ____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)
☐ A check is enclosed.
☐ Payment by credit card. Form PTO-2038 is attached.
☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 12-2325 (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)
☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature Patty Giebler Date 12-22-08

Typed or printed name Patty Giebler Registration No. ____

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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PAGE 1/1 * RCVD AT 12/22/2008 10:48:31 AM [Eastern Standard Time] * SVR:USPTO-EFXRF-4/22 * DNIS:2732885 * CSID:9085823850 * DURATION (mm-ss):01-26

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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/820,111	02/03/2009	7487240	ALC 3125	8431

7590 01/14/2009

KRAMER & AMADO, P.C.
Suite 240
1725 Duke Street
Alexandria, VA 22314

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 838 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Denis Armand Proulx, Kanata, CANADA;
Craig Ellirt Timmerman, Ottawa, CANADA;
Felix Katz, Ottawa, CANADA;
Margaret Rachniowski, Nepean, CANADA;
Afshan Zabihi, Kanata, CANADA;
Macmohana Singh Virdy, Ottawa, CANADA;

AO 120 (Rev. 08/10)

TO: **Mail Stop 8** **Director of the U.S. Patent and Trademark Office** **P.O. Box 1450** **Alexandria, VA 22313-1450**	**REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK**

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:20-cv-489	6/3/2020	Western District of Texas

PLAINTIFF	DEFENDANT
WSOU INVESTMENTS, LLC d/b/a BRAZOS LICENSING AND DEVELOPMENT	ZTE CORPORATION, ZTE (USA) INC.; ZTE (TX), INC.

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 U.S. 7,487,240	2/3/2009	WSOU Investments, LLC
2		
3		
4		
5		

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	**DATE OF PATENT OR TRADEMARK**	**HOLDER OF PATENT OR TRADEMARK**
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

AO 120 (Rev. 08/10)

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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
6:20-cv-190-ADA	3/16/2020	Western District of Texas

PLAINTIFF	DEFENDANT
WSOU INVESTMENTS, LLC d/b/a BRAZOS LICENSING AND DEVELOPMENT	Huawei Investment & Holding Co., Ltd., Huawei Technologies Co., Ltd., Huawei Technologies USA Inc., Huawei Device USA, Inc.

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 US 7,487,240	2/3/2009	WSOU Investments, LLC
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DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy